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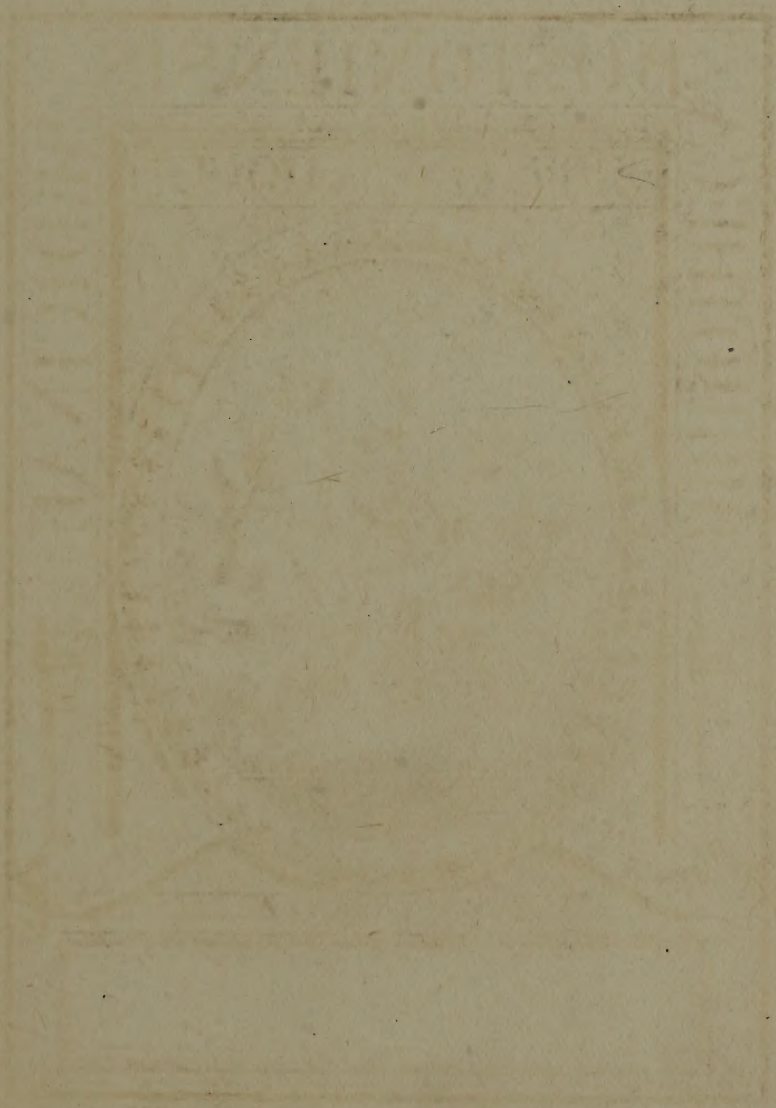

MEDICAL COMMUNICATIONS

OF

THE MASSACHUSETTS MEDICAL SOCIETY.

WITH AN APPENDIX,

CONTAINING THE PROCEEDINGS OF THE COUNCILLORS AND OF THE SOCIETY.

VOLUME XIX.

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IN THREE PARTS.

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ARTICLE I.

THE ANNUAL DISCOURSE.

THE PRESENT STATUS OF THE PRACTICE OF MEDICINE, AND THE URGENT NEED OF MORE STRINGENT APPLICATION OF HYGIENIC AND SANITARY LAWS.

By WILLARD S. EVERETT, M.D.
OF HYDE PARK.

DELIVERED JUNE 11, 1902.

NOTE.—At an Adjourned Meeting of The Massachusetts Medical Society, held Oct. 3, 1860, it was

Resolved, "That The Massachusetts Medical Society hereby declares that it does not consider itself as having endorsed or censured the opinions in former published Annual Discourses, nor will it hold itself responsible for any opinions or sentiments advanced in any future similar discourses."

Resolved, "That the Committee on Publications be directed to print a statement to that effect at the commencement of each Annual Discourse which may hereafter be published."

THE PRESENT STATUS OF THE PRACTICE OF MEDICINE, AND THE URGENT NEED OF MORE STRINGENT APPLICATION OF HYGIENIC AND SANITARY LAWS.

Mr. President and Fellows
of The Massachusetts Medical Society:—

Such is our theme to-day. But you must not expect to listen to a scientific exposition, or an elucidation of some new or great principle or application of a principle, that is destined to overthrow prevailing customs or change the practices of men. You must not prepare yourselves to find a new or unexplored mine of intellectual wealth revealed. For these acquirements search must be made elsewhere.

But happily an exhibition of great learning is not needed now. The Shattuck lecture, with its marvelous wealth of scientific instruction, and with the exhaustive treatment of the subject, so ably presented by our honored guest; the various dissertations that have been given in the different sections, together with the comments and discussions by which they have been followed, have supplied all the intellectual and scientific aliment that is needed to redeem the exercises of these anniversary days from the charge of being useless and unprofitable, and this one hour may well be devoted to lighter themes.

And so I will invite you to be patient with me while I shall indulge in some of the reflections, and make some of the suggestions, and state some of the conclusions that have been evolved from the experiences and in the course of a practice extending over a period of nigh forty years. And

as the events and transactions of those forty years pass in review before us like the shifting scenes of a panoramic landscape, memory will be busy with its visions and thought gravitates easily and naturally into meditative and reminiscent moods. And it is but the natural exercise of the ordinary functions of mental activity that leads to a general survey of the whole broad field that lies before us, and attempts to penetrate, even with our imperfect vision, some of the mysteries that lie beyond.

The changes of those years have been many. The men who were then in active life, and who were then giving character to the medical profession, are gone. But few of those who were in active practice when those forty years began, are with us now. New customs have supplanted the old. New practices have displaced those that prevailed at that time. New measures have been introduced. Former ones have become obsolete, and with the men that sustained them are gone to the shades. Altogether the former things have passed away. Changes are apparent everywhere, and but little remains except the memory of those fleeting but eventful years. But medical science has not stood still. Increased facilities for acquiring knowledge, improved instrumental aids, and industry and devotion have produced their results.

In some lines of human endeavor the advancement and the progress of medical science have been magnificent and great. In the department of surgery, and in all that pertains to the surgical art, its achievements and its victories have outrivaled the dreams of visionaries of a few years ago. To us, from whom the future is hidden, it almost seems as though the limit had about been reached.

It is not easy for one endowed with only common faculties of observation and reason, to imagine in what direction improvement in surgical processes can much farther go. Yet others have thought so before our time. Ambrose Paré

thought so once, and informed the world in 1579 that there seemed to be but little left for posterity to accomplish "but a certain small hope to add some things." His words sound to us like boasting. But the man who sent the torturing searing iron, the hot pincers and the blazing pitch to the museums of the antiquaries, to rest there forever as surgi cal appliances and as curiosities of the days gone by, by substituting for them the simple ligature for the arrest of hemorrhages, may well be pardoned for some self-glorification, for the changes he himself had wrought in surgical processes, though there yet remained such marvels of progression to be revealed in the future, that then were hidden from his dazzled gaze. We wonder, as a clearer perception of his position dawns upon us, if the medical antiquary of three and a half centuries hence, as he delves into the archives of our epoch, will indulge in the smile of complacency or of derision, with which we read his words.

And we wonder also what can happen that shall make the chasm between our own times and the centuries that are coming, as wide as that which separates us from the times of which he wrote. Yet we know not what a day may bring forth. Surprises in surgery are constantly occurring, and it may be confidently predicted that in some way or other a progressive future awaits the art of surgery yet.

In the department of medicine, however, though the changes have been many, if it is true that by their fruits ye shall know them, we cannot feel quite the same assurance that the real advances in dealing with diseases have been correspondingly great. Yet we do not forget the work that medical science has done. We do not forget Jenner, nor Pasteur, nor Koch, nor those who follow in the paths where they have led. We do not forget that great learning, immense wealth and untiring industry are laid upon its altar, and are expended without stint or limit in the study of diseases, and we are not unmindful of the result.

We do not forget the means that have been perfected for our assistance, nor the aids that have been placed in our hands. We do not forget all that we owe to the clinical thermometer, the use of which had never been suggested fifty, and scarcely forty years ago. We do not forget all that has been learned from urinary analyses, that were rarely thought to be essential then.

We do not forget the hypodermic needle, nor how opportunely or providentially the antitoxins have come to our aid. We do not forget the thyroid extract, by means of which the unsightly and distressing myxedema has been made to yield. We do not forget what the Röntgen rays are doing in making plain what was hitherto invisible, nor that their palliative, if not curative, action upon sarcoma and carcinoma and epithelioma are rapidly passing beyond the experimental stage.

We do not forget the improvement that followed when the indiscriminate use of the lancet yielded its place to milder measures or to gentler stimulation, nor the disgust that was avoided when the nauseating doses of a former period were so largely superseded by the triturate tablet and the sugar or gelatine coated pill.

And we do not forget the wonderful improvement in pharmaceutical preparations, that the progress of the times, as directed by medical science, has demanded, and that these latter days have ushered in; and contrasting them with the vile concoctions that were forced upon the sick and the suffering, in the days when crabs' eyes and blind puppies, earth worms and human skulls, had a place in recognized formulæ, in standard pharmacopeias of the period, and a commercial value as staple articles in the catalogue of pharmaceutical supplies, we felicitate ourselves with great joy and gladness that the lines have fallen to us in more pleasant places, and bless with sincerest gratitude our ancestral lineage that our existence was delayed to these later days.

And finally, we do not forget the great multitude of investigators that have so long been focussing their microscopic lenses upon every form of pathological condition, with the hope and determination of tracing the ultimate causes of every form of disease.

We do not forget that never in the history of medicine or of the world have the searchlights of science been cast more persistently or more determinedly upon these bewildering problems, to work out their solution, than in these later years.

Never have clearer heads or keener intellects or braver hearts grappled with these perplexing difficulties, either to find the way to overcome them or to demonstrate the impracticability of the attempt. Indeed, so far has science already led us, that the personal element in the profession is being largely eliminated from the account, and the oldtime independent thought, self-reliant judgment and prompt, decisive action — not always without their errors, it must be admitted, yet useful in many ways — that belonged to a former generation, are rapidly and it is to be feared altogether, disappearing; and where once the way seemed clear before us, and pathognomonic symptoms clearly and sharply defined; we now hesitate and falter, if we do not positively decline — even while disease is rushing onward with increasing and dangerous rapidity — to render a diagnosis, until the revelations of the microscope or the bouillon cup have either exploded or sustained the views we have entertained. And we do not question their conclusions. We only learn to distrust our own.

And if there are those among the older practitioners who ask if the best interests of the sick and the dying are always subserved in this way; whether the accuracy of a mathematical demonstration is always secured by methods like these; if there are those who claim that habits of lifelong observation and years of experience at the bedside are en-

titled to some consideration still; if there are those who believe that the trained perception, the quick ear, the keen eye, the sensitive touch, that years of practice have intensified, if they have not perfected, are entitled to a place for practical purposes in the armamentarium of the physician that neither the exhibitions of the microscope nor the logic of the laboratory can fully supply, and that they will sometimes lead to just conclusions, before either the microscope or the laboratory can so prepare and adjust their specimens as to pronounce definitely upon the result; yet even these are willing to concede, when they do not conceal their misgivings, and while reserving to themselves the privileges of private judgment and independent action, do not hesitate to fall into line in the great procession that marches to the music of progression where the heralds of science blaze the way. And it is well. Heaven grant to these pioneers of science an unobstructed sway! Heaven grant to them abundant success to their labors! Heaven grant that their work may continue to prosper, until they shall find not only the germs of all diseases, but shall also discover the means that shall dislodge them from their place!

All honor to those noble men. All honor to those worthy ones who are denying themselves so many of the things that add to life's enjoyment, that they may devote their best years to this beneficent work. All honor to those who are teaching us the beginnings of disease. Let all encouragement be given them to continue in the paths they are pursuing, till they shall also teach us how to bring their work to a successful end. Let all praise be theirs for results already won. We honor them for their devotion to the work they have undertaken; we respect their conclusions; we follow their directions; we adopt their recommendations; we proclaim their fame while they are living, and rear monuments to commemorate and prolong their memories when they are gathered to their rest.

But the old conviction comes back to us still. If the purpose of study and of treatment is to cure disease, and so to promote the welfare of humanity, then the ultimate purpose of medicine is not yet in sight. When all our investigations are completed, when our studies and researches are done, when the improvements in management and the additions to our resources have either demonstrated their value or failed in our hands, the grand object of curing disease by medication, so far at least as many diseases are concerned, is not gained.

Tuberculosis remains the same unconquered and unconquerable foe to human life that it has been always. And in cases where improvement has been noted, it has been accomplished less by medication than by hygienic means. Pneumonia swept away 5,282 victims in 1900, in Massachusetts alone. Typhoid fever remains typhoid fever still. And neither improved—or at least varied—methods of treatment, nor cold ablutions, nor chilling immersions, nor Widal tests, nor microscopic views, nor corpuscular computations, have perceptibly changed its character in any essential particulars, from the fatal and fearful affection that baffled the skill of the physician in the days of our predecessors, and that resists with equally stubborn obstinacy the best directed efforts of our own. It regards neither rank nor condition; it abates not one degree of its destructive energy, whether its visitation fall upon the heedless victim of his own carelessness and needless exposure, or on our own cherished and beloved governor, who relinquishes the chair of State and retires from the duties of the gubernatorial office long enough to come in here with us year after year, to honor us with his presence, and to speak to us words of encouragement and praise.

And the humiliating thought that adds the keenest pang to our affliction is that both the sanitarian and the medical profession are committed to the opinion that its place is in the

catalogue of preventable disease. There were fifteen diseases whose fatality was greater in Massachusetts, in both 1890 and in 1899. Whether its rank throughout the country in those years was higher we do not know. But in 1896, Dr. Bradford tells us, in the Annual Address* for 1899, that it claimed 75,000 victims in the United States.

We know not and are not now considering "whether disease is a part of the plan of creation," but we know that existence is hedged round with so many unfavorable conditions, that danger surrounds us like an atmosphere from life's beginning to its close. In whatsoever paths our feet are guided, disease is everywhere present with us still.

We do all that medical science in the present state of its development suggests and all that experience teaches, to counteract the ills that beset us, that we are obliged to acknowledge we cannot prevent at present and do not always cure. We build hospitals in every city, and furnish them with every convenience and necessity for the care of the helpless and the sick. We secure to them the best attendance that the medical profession can supply. We build expensive laboratories, and equip them in liberal fashion with every useful appliance, in the hope that every new aspect as it makes its appearance, as well as every structural change, may be noted and assigned to its appropriate place in the etiology of disease. We exhaust our knowledge of the pharmacopeia and the products of the earth, the sea and the atmosphere in devising new antidotes for the relief of whatsoever maladies afflict the children of men. We experiment with every new remedy or combination of remedies that is commended to our attention as possessing special adaptation to special diseases or uses, to the end that we may thoroughly test their virtues, and when they have disappointed us sufficiently we cast them aside. We invoke

* Medical Communications, Massachusetts Medical Society, vol. xviii, No. 1, 1899, Annual Address, p. 33.

the aid of all the resources that can be made available or be supplied from any quarter, to counteract the ravages of those living organisms that science tells us are wasting life away. We dismember the body when its life has departed that we may subject its every tissue to a scrutiny that was impossible while its subject was living, to ascertain the ultimate structure as well as function of the minutest filament of muscular fibre or the smallest spiculæ of bone. Neither nerve tissue nor brain substance escapes us. Nothing is overlooked, and nothing satisfies until we have resolved the whole human structure to Virchow's universal cell, and located all our many troubles in the cellular transformations and atomic changes that have their origin there.

We stifle our feelings of humanity and pity, in the interest of science, and subject the lower orders of creation to direst suffering and agonizing death, and composedly study from their vicarious anguish the pathologic processes that, artificially induced in their less respected bodies, seem to be identical with the cellular changes that take place in the human system in the same disease, and in so doing, hope to learn from their distresses how to relieve our own.

We try to follow in the paths wherein the men of science lead us, though we may not fully comprehend their ways. We study the published reports of their proceedings, with the determination—if not with an entirely successful attempt—to master and appropriate to our own uses the lessons of wisdom that they teach us, and make in some measure their wealth of scientific lore our own.

We apply ourselves with diligence and assiduity to the mastery of the marvelous vocabulary and nomenclature that has been developed in the progress of the science, and tax our mental machinery to its limit, while we wrestle with the intricacies and technicalities of accurate scientific expression, till microbe and leucocyte, bacteria and bacillus, and spherical cell, and cylindrical cell, and spindle cell, and miccro-

coccus, and streptococcus, and staphylococcus, and diplococcus, and spores, and ptomaines, and spirillum, and vibriones, become familiar, if not always distinctly differentiated or perfectly understood, terms.

We divide ourselves into schools and systems and specialties, and argue and dispute with one another in controversial earnestness, even to the verge of desperation and ill temper, in vainly attempting to discover or determine which modes of procedure of all that are presented are best—for the patient's well being, if so it may be— or, failing that, for bringing to our own exchequer the amplest return.

We do all this, and we do much more. We hold ourselves in readiness to respond to every call for medical assistance, however slight the occasion or attended with whatsoever of inconvenience or self-sacrifice it may be.

We sink into the depths of despondency and discouragement when death defeats our best endeavors, and hardly recover from our disappointment to a normal plane of hope and cheerfulness when—as does sometimes happen—we have the satisfaction of believing that we have been instrumental in prolonging a life. We grapple courageously and fearlessly with diseases of every description, however dangerous in their character, as though there were neither contagion nor infection nor personal danger in the world.

We do all these things. We fight to the last to save our patients, but the arch enemy is mightier than we. Disease and death will not be vanquished. They remain with us still. The fight with them goes on forever. It has been going on through all the centuries. It is going on still. The combat is never ended. The battle is never won. Our efforts to overcome them are thus far largely futile. Our most earnest endeavors to eradicate them are thus far at least partially in vain.

Men die — die in the vigor of useful and prosperous manhood; die when life's responsibilities are greatest; die

when ties of affection are strongest; die when life seems most essential to the family and to the world. Youth and beauty are stricken by the fell destroyer, and go down to the silent chamber, ere yet the first taste of life has lost its exhilarating flavor, and fade out of existence ere yet the mildew of time has touched the hem of the garments that adorned their primal bloom. Fathers and mothers stand in hopeless but unavailing sorrow round the couch where the pride of their eyes and the joy of their hearts is breathing out its infantile and agonized existence, and gaze imploringly, beseechingly — and it may be reproachfully — into the face of the physician, whose countenance does not cheer them, whose word can yield them neither hope nor encouragement, and whose impotent hands are powerless to bring them relief. There is no need to overdraw the picture; but it is useless to keep the truth from sight.

Statistics might reinforce these statements, but everyone knows that they are true. Or if there are those who doubt them, let them search the registration reports, and review their own experiences for themselves. We are assured that the death-rate is diminishing, and gladly believe that it is true. But granting all that is claimed for increasing longevity, the rate is yet sufficiently high. The churchyards are constantly receiving their accessions, are multiplying in numbers everywhere, and are extending their areas; and because they are encroaching too largely on valuable territory, as well as becoming in themselves a menace, the crematory fires are kindled and are blazing with fervent heat.

And this deplorable mortality is not confined to the aged, whom all know must die. Neither can it be attributed to a scarcity of physicians, for there are but eight states in all our broad land where there are 1,000 persons to each physician; and from thence the range is down to one in 420 in California, which seems of all the states in the Union, to be most abundantly supplied. In Massachusetts, in whose

welfare we are more particularly interested, the ratio is one to every 539. Throughout the whole country there is, or was, in 1898, one registered physician to every 647 persons. And yet this excessive mortality exists, and it is not an accident of recent times. It is as ancient as the historic page. It was thus in the days of the psalmist. It was thus when the poet paraphrased his words:

> "'Tis but a few whose days amount
> To threescore years and ten."

It was true when these words were written, and it is true now. Disease is lurking everywhere. Life is imperilled at every step. The causes that induce the one and sustain the other seem mingled in unutterable and inextricable confusion, and overwhelm us in doubt and perplexity, from which while existing conditions continue, we can look forward to no release.

The atmosphere that supports respiration is laden with pathogenic germs. The elements that supply nutrition become the messengers of death. The mother's kiss imparts contagion, and the hand that is grasped in the fervor of friendship finds contamination concealed in its clasp. The balmy Southern breezes that refresh and cool the fevered forehead waft their miasm from the savannas of the southland, and the rugged northern tempest that imparts its energizing vigor brings its microbe with its chill. It was a microbe that sapped out the lifeblood of the blue-eyed and fair-haired creature that grew up with you in your boyhood, whose hand restrained you in the recklessness of adolescence, when even your mother's wishes were not always obeyed, and guided you into paths that have led to your present high estate, and whose loss left a void in your existence that the world has never filled, when she died; and it was a microbe also that caused the bread she ate to rise.

The same organisms that produce the ferment that keeps the earth in condition suitable for human habitation, are

more destructive to those who dwell upon its surface than the rifle or the sword.

The insect world arrays itself with the forces that compass our destruction, and comes swarming round us in its myriad forms, not alone destroying our comfort with its annoying presence, but exposing us to dangers that are too subtile for our unsuspecting senses to recognize, but too powerful also, in their aggregate numbers, to be easily dispelled or controlled. And even the contemptible and villainous little mosquito, seemingly too insignificant to be worthy of notice, and which we feel it to be beneath the dignity of manhood to recognize, even as an annoyance — if it is the truth that is told about him — has sins and transgressions little less diabolical than murder, laid to his charge. Some one may object to the use of the masculine pronoun here, because they tell us that it is the female, in this instance, that makes the mischief, as it was at creation's birth. But perhaps the generic title may be permitted here as being adapted to our present purpose, while we leave them to arrange the question of individual responsibility between themselves. Yet against the insidious attacks and incursions even of so despicable an enemy, we have neither defense nor protection, save only by calling to our relief, assistance, and even preservation, the whole gigantic machinery of the Standard Oil Trust, which backed by all the Rockefeller millions, is able to furnish only a partial guarantee of immunity, in the ratio of fifteen square feet to the ounce. In this new David and Goliah contest the advantage is certainly again with the sling. Yet life has greater foes than he; for when the worst has been said against him, it must be admitted that at worst he is an open enemy. Whatever potentialities of mischief may be concealed within his diminutive figure, his attacks are never disguised. We can see him, we can hear him, we can feel his sting; and warned in this manner of his presence, we are given some opportunity to protect ourselves.

But the greatest foes of existence are those that do their work unseen and in silence, and that nothing less powerful than a microscope can render visible to human sight. Yet the devotees of science assure us that in these microscopic organisms are traced the elementary sources of all disease; and they assure us, also, that it is to counteract or prevent their ravages that the best energies of medical science can be most effectually applied.

Such, then, appears to be the status of medicine, as these first years of the century begin. We note many improvements, we recognize many and great advances in the administration of medicines, but we cast our gaze outward over a world of sickness and suffering yet. The normal condition of existence should be one of perfect health. The perfect type of life on this earth is a sane mind in a sound body, from the earliest moment of existence, through the intermediate stages of development and maturity, until it shall terminate finally in the processes of natural decay. Yet a condition of perfect health in any large community is nowhere to be found. Some allowance may perhaps be charged to the inherent imperfections of our nature. But if we attempt to account for the universal prevalence of disease upon any such theory, we deceive ourselves.

Do we find encouragement and comfort in comparing our own times with the past? We search through its annals, as guided by the light of history, to find that in the sixteenth century the average duration of human life was from eighteen to twenty years. At the beginning of the nineteenth it had reached to thirty years. And now, as the twentieth century opens, it is said to have been extended beyond forty years. But why tell of that? Why count that as a victory for therapeutics which possibly may have been accomplished in other ways? Are we certain that the administration of medicine has produced the change?

Running parallel with all this increasing longevity, and

precisely corresponding with it, both in regard to times and localities, are better modes of living, fewer unseemly and unwholesome practices, wider streets, purer air, and the introduction of sewerage systems and unpolluted water supply — all advances in sanitary and hygienic conditions, with which therapeutic agencies have nothing to do.

And what of the future now? Signs are not wanting that indicate along what lines the advances of the twentieth century shall come. And prevention seems, in the light of history, more promising in its results than attempts at cure. Probably hygienic measures will never supersede the use of therapeutic remedies in the treatment of disease. But we well may anticipate with satisfaction the approach of that season when they shall be blended together in a closer and more beneficent union than the world has ever yet known.

Preventive medicine is no new thing. Nor is it one whose importance or influence upon the public health need be urged upon a body of physicians for the novelty of the subject or for the originality of the thought. Its importance has long been recognized. Boards of health have been appointed specially to enforce its requirements. Volumes have been written upon public hygiene. Preventive medicine and the discussions that have followed its recommendations have long occupied a prominent position in the medical literature of the times. Discourses have been read to us that have placed the subject before us in a manner as convincing and as truthful as can find expression in language, and in terms that admit of no reply.

Boards of health, both state and local, have urged upon us the need of improvement in sanitary conditions, with force of statement and cogency of reasoning that no argument can refute. Public health associations make sanitary science their chief purpose and study. National conferences of state and provincial boards of health seek to secure cooperation and uniformity of methods of doing their work.

The American Medical Association organizes a section to discuss state medicine and public hygiene. The American Climatological Association wrestles with the problems that our ever varying and always trying climate presents. They all tell the same story. They all say: Pure air, pure food, comfortable clothing, freedom from exposure to pathogenic germs.

We have been told also, until the repetition induces a sense of weariness, that wherever putrefactive processes are going on; wherever there are accumulations of that material which we call filth in contradistinction from dirt; wherever stagnant pools or swamps abound; wherever marshes exhale their deleterious vapors; wherever tenements are overcrowded, and wherever lack of proper ventilation exists; wherever food products of every kind are placed upon the markets, and so upon the tables of the hungry, in improper condition; wherever agricultural processes are carried on, especially such as relate to milk production and meat supply, without proper regard to sanitary requirements and purity and cleanliness; wherever the effluvia from sink drains and house offal mingle with and vitiate the air that is breathed; wherever noxious weeds or plants contaminate the atmosphere with their infectious exhalations; wherever drinking water is polluted from any cause; wherever streams and rivers are made foul by waste from manufactories, or from being used as receptacles of decaying matter of every description, all along their courses; wherever the smoke nuisance envelops us like a cloud; wherever these things exist, we have been told sufficiently often that danger exists also. There the microbe revels; there the bacillus watches for his prey. And there preventive medicine and preventive measures are needed always, to destroy their power of doing harm.

It is true that the work of the medical profession appears in all this. It is true that it is science — medical science

— that makes these matters plain. It is true that it was medical science that first discovered the microbe, and it was medical science also that first suggested the measures that should terminate his work. It is true that the guiding hand of medical science has given direction to all these proposed or actual measures of sanitary improvement and reform. It is true that it is because of medical science that the rivers of waters that take their rise among the unpolluted springs and streams of the highlands and the mountains are rushing onward with impetuous speed through their conduits and channels, in haste to allay the thirst of the famishing millions that crowd the cities' contracted areas. It is true that because it is the best method for its disposal that medical science can devise at present, that so much of the waste of the earth that is concomitant with existence is drained through miles of impervious conductors and buried in the sea. It is true that whatever improvement is to be noted in these, and in other particulars, has resulted from medical science and the facts that medical science has made known. It is true that they who have been instrumental in inaugurating all these reformatory enterprises, whose benefits are already so great, as well as in projecting others which it must rest with the future to complete, have been chiefly medical men. It is true that it has been the voice of medical science that has set forth so clearly the dangers that still are threatening, and it is the voice of medical science also that is yet busy in calling for measures of relief. It is true that it has been the trumpet blasts of medical science that have brought these topics to our attention, and have thundered their ominous warnings so often and so loudly in our ears.

But repetition does not stimulate to activity. Argument does not renovate a broken constitution. Discussion does not destroy the industrious germ. And so, in defiance of all that medical science or common knowledge has taught

us, these dangers yet remain — a constant menace to life and health. Our rivers are too often streams of pollution; our tenements are overcrowded; our food products are not always above suspicion; our milk supply is not always free from danger; our drinking water is not always pure. And so there is work yet for medical science to do.

The intense activities that have marked the nineteenth century have gone far in many beneficent directions, but they have left to the twentieth an inheritance of labor and of duty that must not be postponed.

Dr. Salmon, veterinary of the Bureau of Animal Industry in the Department of Agriculture at Washington, makes this remark: "Without doubt there should be greater efforts than have yet been put forth in this country to secure a pure and wholesome food supply. Those who are working in this direction need the encouragement and aid of the general practitioner of medicine, I might say of the whole medical profession. They need even more than this — the experience and knowledge which are gained by the men in the active practice of medicine."

Thus does the representative of our government at Washington recognize the agency and influence of the medical profession in the prosecution of this department of its work, thereby practically making the acknowledgment that the work is not yet thoroughly nor satisfactorily done. And so, because it is not, our strong men perish, and so our children die. When sixteen children in every hundred born in Massachusetts have died before they were one year old, through twenty successive years — twenty-five in every hundred, according to high authority, is the ratio in all large American cities; — when 11,500 of the little ones die in a single year, as happened in Massachusetts, in 1900; when 47,266 persons, or very nearly one in every fifty, of the total population of the State, exclusive of those who die by violent death and also those who are reported as dying

of old age, die in Massachusetts in a single year, a large percentage of whom die from zymotic or infectious diseases, which should be largely if not wholly preventable, there is certainly something left for medical science and the twentieth century to accomplish which all the centuries that have preceded it have left incomplete. These facts appear in the registration reports for 1900.

And to him whose nature is easily moved to sympathetic sorrow for affliction, they may well be deemed sufficient to bring into activity a train of sentimental reflection that quickens the heart throbs and suffuses the eyes. The suffering and distress of those whose support is thus taken from them, and the moans of the despairing mothers of the eleven and one-half thousand babes that are dying, should burst the clouds of indifference that surround the subject asunder and cause the deaf heavens to hear.

While these unsanitary or unsafe conditions prevail, whose existence is a matter of common observation, which every man of science assures us invite disease; while these fatalities continue, as we must believe largely in consequence of such condition, faithfulness to the obligations of an honorable calling, that is charged with the great responsibility of the preservation of the public health, demands that the medical profession shall devote its energies more systematically and more determinedly to the inauguration of improved systems of sanitation that may result in better things.

And so there has been no reluctance in bringing the subject of preventive medicine before a gathering of physicians, confident in the assurance that it cannot be out of place. The times are propitious and the need is great. It must be the coming topic for discussion and for settlement and for urging upon popular support and favor, as these early years of the century begin. Its benefits are certain; its possibilities are great. Perhaps in this way we may discover the

explanation of some of the hidden mysteries of our being that seem incomprehensible now.

Perhaps we may learn why it is that the food that nourishes the body becomes its destroyer, too. Perhaps it will yet tell us why the same region that engenders the chill and the ague becomes a balm to the sensitive lung. The guiding stars of science indicate that the paths of progress lead in this direction, and undoubtedly the most encouraging and satisfactory successes of the period are to come in this way. It may win fame for no one, to be identified with the movement, in favor of sanitary science, but it will furnish an opportunity for doing a world of good. It may be less fascinating than a surgical exploit, but its beneficence may be multiplied hundreds of times. It is a marvelous achievement certainly, when it happens, and should bring renown and honor to the operator, to lift the curtain of darkness that veils the light of reason, and by a bold and hazardous surgical operation to restore a wretched and pitiable idiot to useful and rational life. It is a wonderful thing truly, and is deserving of all admiration, to suture a stab wound in the heart successfully, and so to prolong a life.

But probably these occurrences will not come very frequently into the ordinary life of the physician, and it may be that even Dr. Sternberg of New York, with all his great abilities, who was so successful in the former instance, and Dr. Nietert of the City Hospital at St. Louis, who performed the stab wound operation, may be compelled to rest their claim for exceptional distinction in these classes of cases — and they may well be content to do so — upon their success in a single case.

Opportunities for doing great things do not often happen, and perhaps in the practice of medicine, least frequently of all. But here the little things count. And he who secures to the children of Massachusetts a milk supply that shall

yield the required nutrition, and yet be free from pathogenic organisms, will save thousands of lives. He that shall devise some method of harmlessly destroying or removing decomposing material, wherein disease germs originate, will save thousands more. Whoever will find a way to prohibit the pollutions that accumulate upon the earth's surface, and that are now permitted to contaminate the water that is used for domestic purposes, from reaching their present destination, will delay the flight of uncounted numbers to the celestial regions, and will prolong their stay upon the earth. But certain questions arise and need to be answered.

When so many organizations and agencies are working so actively and so harmoniously together, with these objects in view, what reason for dissatisfaction or discontent remains? Just this one: results at present are not commensurate with humanity's needs. When peace and harmony combine so happily to work out the solution of these intricate problems that interest so many, what excuse can be given for fermenting a feeling of uneasiness and unnecessary fear? Simply this: nigh fifty thousand persons die in Massachusetts every year, at an age when the insurance tables of expectancy would have assigned to them a longer life.

But what more can be done? The one thing that more than anything else is needed is to awaken a public sentiment that, realizing and comprehending the great importance of these measures, will not only justify and encourage an expenditure that shall be adequate to the destruction of conditions that foster the development of diseases, but shall imperatively demand such expenditure and such destruction wherever disease germs are found.

If, then, efforts are properly directed, and if superintended by competent guides and directors, the closing years of the century that is opening should witness results in the

department of medicine hitherto unattainable and that shall equal or rival the surgeon's most extravagant claims. If the valleys and waste places are teeming with dangerous bacteria, they must be exalted. If the mosquito is such a dangerous creature, the place of its abiding must be destroyed. The mountains may not be brought low in every instance and the mountain wind may not be tempered by human devices nor adapted to the needs of the tubercular diathesis, but the human subject may be taught, perhaps, to protect himself from its chill. If the appearance of the milker is suspiciously or conspicuously uninviting, he must be made to see the necessity of either changing his occupation or his methods of doing his work.

And so on—and so on! Through every department of human experience there is need for constant supervision, watchfulness and care. If individual interests, or rights even, are invaded and become antagonistic to the public needs, then individual interests and rights must be made subordinate to public necessity, when public safety is the issue that is involved; and, if it be possible that whatever is for the public benefit can be detrimental to the interests of the individuals of which the public is composed, then compensation for the injury that is inflicted must be allowed.

It will be objected—and not without reason—that the expense of such a movement will be enormous; and it is true. But the loss of fifty thousand, or thereabouts, of useful and cherished Massachusetts lives per annum, is a more costly and deplorable sacrifice still. The cost is not an insuperable objection nor obstacle against the expenditure of whatsoever of treasure these improvements and reforms may require. The means can be provided to procure the laborers, and the laborers are ready to do the work, and results will fully justify—even if they do not amply repay—all the expense that need be incurred. And means can be found by which all these things can be done.

Capital can furnish means to do great things. It can tunnel mountains. It can cover a whole land with a network of railroads, even to its most inaccessible regions, and settle its waste places with a busy, thriving and prosperous people that increases its wealth and its power. It can find means to turn the waters of Niagara into a source of revenue. It can cross mighty rivers with bridges of enormous span. It can find means to flash its signals unheralded through the air. It can secure communication with most distant regions, and astonish them with messages that pass the sunlight, in their journey around the world. It can illumine its mansions with the lightning of heaven and literally hitch it to its car. It can execute and maintain enormous trusts. It can combine steamship lines. It can monopolize traffic and transportation and trade. It can spend uncounted thousands in testing and perfecting a piece of heavy ordnance, and it can build forts and arsenals without considering the cost. It can build battleships that are apparently invincible. It can create navies that are at once the wonder and admiration, as well as dread and terror, of the world. It can equip and maintain armies that no power on earth has yet been able to withstand. It can support courts and camps. It can fit out costly expeditions to most distant places to observe under most favorable conditions the occultation of eclipses or the transit of a star. It can extract luxury, as well as profit, from winter's dreary and desolate fields of ice. It can find remunerative employment in blasting out huge and shapeless masses from the barren and unimpressionable granite quarry, and transforming and fashioning them into forms of surpassing beauty, and adapting them to purposes where ornament blends with permanent use. It can dig treasure from the mines of the earth, and refine it at the smelting furnace and stamp it at the mint, in quantities that are most conveniently handled with a derrick and gathered with a spade.

It only fails of its purpose and is beaten and defeated when it attempts to find a northwest passage to reach the northern pole, and to construct a practical, safe and useful flying machine.

And the amount of money that has been lavished on either of these questionable—even if successful—projects would, it is very probable, give us all that we ask or need. And it neither satisfies or pacifies our desires nor convinces our judgment, to tell us that we transgress the bounds of prudence when we ask it to come to our assistance when so many precious lives are involved. It is idle to tell us that whatsoever of capital is demanded to secure the public health and safety—whether it be much or little—cannot be furnished without either perceptibly impairing its energies or seriously obstructing its designs.

There is no doubt, there can be none, that the ravages of disease will be greatly diminished and the death-rate correspondingly changed when suitable measures shall be adopted for carrying projects like these into execution, and thus affording protection to those who do not or cannot protect themselves. And if, indeed, their excessive cost should seem to justify a doubt of their expediency, yet the times are come upon us when every consideration and dictate of humanity, of philanthropy, of zeal for the public safety, of interest in the progress of medical science, demand that the experiment shall be no longer delayed.

It is time to end this homily, that seems but just begun. The subject is inexhaustible. But the hand will move upon the dial plate, and you are growing weary, and a more alluring entertainment is awaiting you in the hall below. The great multitude that represents the medical profession in Massachusetts are gathering, eager and impatient, to exchange those kindly greetings and interchanges of recognition that cement more strongly the sympathetic tie that binds them, as they gather round the social board. Our

annual festival does not fail. Year by year, as the sun approaches the solstice, we note — if we do not always welcome — its return. It has its delights and its enjoyments, but it has its suggestions too. Year by year we find ourselves moving farther and farther upward toward the head of that great procession that marches, not only into the anniversary dinner, but into "the pale realms of shade" as well, whither so many have preceded us whose forms and features have been familiar to us in years that are gone when we were marshaled to our places in the rear, and whom we have watched year by year, to see them gradually putting off the robes of stately manhood, to wear the crown that only age could bring them, and then to disappear, that they who joined the Society in the decade next in order, might move upward to the places that had belonged to them.

The century is at its beginning. At its close no one of us will remain. But that matters not; the world will move on. Medical science will continue its work for humanity, will make new discoveries, will find new and better ways of controlling diseases, will establish more perfect and effectual methods of arresting and destroying the causes on which they depend. Generations will come and go. The young, hopeful, ardent, eager, aspiring, ambitious graduate in medicine will take his diploma and enter upon his work with high resolve and noble purpose to win distinguished honors and achieve a brilliant success, as his predecessors for generations have hoped to do. The middle-aged practitioner will pursue his daily round of duty with a calmness and serenity of spirit that no adverse circumstance can disturb, that are born of faith in the value and usefulness of his profession and his labors, and with resignation to the many hardships of his lot, that will sustain him and reinforce his courage when the stimulus of ambition and expectancy has been withdrawn. The aged

veteran in the service will look backward reflectively over the paths that he has trodden and where his fathers have traveled before him, contrasting the new ways with his own, and then will sleep as they sleep.

But The Massachusetts Medical Society will live on; surviving all changes, keeping fully abreast with all advances, it will live on. Strong in the abiding affection and veneration of its members, stronger still in the confidence and support of the people, for whose welfare it exists, but strongest of all in the ever increasing and ever expanding range of its benefactions, it will live on and on; and if it shall be true to its history and equal to the opportunities that await it, it shall rise to higher — and still higher — planes of usefulness and honor, and the voice of millions shall reverberate down the ages in strains of thanksgiving, gratitude and praises for all the blessings it has secured to men.

ARTICLE II.

THE SHATTUCK LECTURE.

THE CHANGES IN THE SPINAL CORD AND MEDULLA IN PERNICIOUS ANÆMIA.

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DELIVERED JUNE 10, 1902.

THE CHANGES IN THE SPINAL CORD AND MEDULLA IN PERNICIOUS ANÆMIA.

I DESIRE to express my appreciation of the honor conferred upon me by the officers of The Massachusetts Medical Society in inviting me to deliver the Shattuck Lecture. Many eminent men have preceded me in this honorable position, and it was with profound trepidation that I accepted the responsibility which precedent had established in giving a high tone to this lectureship. At the time I accepted the invitation to deliver the lecture, I was deeply interested in the subject which I chose for my paper. Pernicious anæmia has been the subject of considerable research work in a clinical way for several years, and as I have had the opportunity of observing the nervous phenomena and lesions of the nervous apparatus which may occur in this disease, I felt that it would be a proper subject for further investigation and report upon this occasion.

Lichtheim was given the credit for recognizing, for the first time, the spinal cord changes which may occur in pernicious anæmia. His report was based upon two cases, and was confined entirely to the changes of the cord in pernicious anæmia. Soon after this his student, Walter Minnich, reported one case in an inaugural dissertation.

The next important contribution was made by James J. Putnam, of Boston, who, in 1891, reported "A Group of Cases of Sclerosis of the Spinal Cord, Associated with Diffuse Collateral Degeneration Occurring in Enfeebled

Persons Past Middle Life, and Especially in Women; Studied with Particular Reference to Etiology." In this paper Putnam mentions Lichtheim's observations of cord changes in pernicious anæmia, and notes the similarity of the cord changes as compared with those observed in his patients. He also mentions the fact that Lichtheim ascribed the cord changes to some blood-circulating toxin. Putnam apparently accepted the toxic theory as the chief etiologic factor in his cases, but he emphasized the fact that the age, the sex, the neuropathic inheritance, poor physical development, nutritional disorders, diarrhœa, etc., were important contributory causes. Putnam's paper did not receive the attention which it merited in Europe. The title was perhaps misleading, in that no mention was made of pernicious anæmia.

Since 1891 many contributions upon the subject of the spinal cord changes of pernicious anæmia have been made abroad and in this country. Nonne; Minnich; Bastianelli; Burr; Russell, Batten, and Collier; Lloyd; Taylor; von Voss; vonNoorden, and many others have reported cases and have described the clinical phenomena, the gross and histologic changes which have been found in conditions usually associated with pernicious anæmia, and also in conditions in which the blood condition was not like that of pernicious anæmia. Similar cord changes have also been noted and reported by some of the above-named authors, and by others in leukæmia, lathyrism, pellagra, diabetes mellitus, diphtheria, and associated with the degenerations incident to poisoning by phosphorus, lead and arsenic.

In 1902, Putnam made, with the collaboration of E. W. Taylor, a second report upon "Diffuse Degeneration of the Spinal Cord," in which a review and comparison of the views of many writers were noted. In this article Dr. Taylor made a most admirable report upon the pathologic anatomy of the nervous apparatus.

In view of these facts, I approach the subject with hesitancy, and proceed only with the hope that an additional report may be interesting, if it does not add anything new to the subject. My observations have been limited to the diffuse degenerations of the spinal cord of pernicious anæmia. The similarity of the cord lesions of pernicious anæmia and of the conditions enumerated by Putnam, by Russell, Batten and Collier and also by other reporters, is so striking that it must impress anyone who reviews the extensive literature of the subject. The similarity of the contributory etiologic factors of pernicious anæmia and of other conditions in which diffuse degeneration of the spinal cord occurs, as reported by Putnam especially, is notable. It is my object to present cases of pernicious anæmia, with the now recognized characteristic changes in the spinal cord, and to discuss somewhat the similarity of the cord changes in pernicious anæmia and in the other conditions above-mentioned.

It is possible that some of the earlier reported cases of diffuse degeneration of the spinal cord were not ascribed to an existing, but unrecognized, pernicious anæmia. It is just as likely, however, that some of the cases reported as pernicious anæmia, with cord changes, were not typical cases of that disease. This statement is based upon the fact that in some of the earlier cases reported the blood state is not noted sufficiently to enable one to recognize the case as one of a pernicious type of anæmia; and, furthermore, at the time when the first reports were made, the means of recognition and differentiation of the anæmias were not as clear as now. In earlier times pernicious anæmia was diagnosed upon the basis of a profound progressive anæmia, associated with a tendency to subcutaneous, submucous and retinal hemorrhages. When to these symptoms was added the post mortem finding of a characteristic, pale, anæmic fatty state of the organs, and especially of the heart, with an increase of iron in the liver, as was noted by

Quincke, and the presence of degenerated bone marrow, the diagnosis was certain. We now have a better knowlledge of the morphology of the blood. We are able to separate the primary from the secondary anæmias, and the blood of the pernicious type is characteristic and easily recognized. When we find a marked oligocythæmia, with the presence of many poikilocytes, microcytes, and macrocytes, with polychromatophilia, and a relatively high percentage of hæmoglobin, with a normal or a higher than normal color index, it affords a type of blood which is found in no other anæmic state. If to this we add the presence of nucleated red cells, and especially of megaloblasts, the fetal type of red cell and of a few myelocytes which together indicate degeneration of bone marrow, the diagnosis is reasonably certain without a postmortem examination.

Cause.—Our knowledge of the cause of pernicious anæmia is not satisfactory. We recognize certain contributory factors and infer a condition of toxæmia which has not been proved. We know that the disease may occur in certain conditions; that these conditions are so frequently present in individuals who do not develop the disease, that we must look upon them as accidental.

Pregnancy, associated with constant vomiting and malnutrition, has been followed by pernicious anæmia. After repeated or severe hemorrhages, and in individuals who are poorly nourished, especially when the poor nutritional condition is associated with some error of physical development, a grave anæmia may follow. It is associated with, or follows most frequently, disease of the digestive apparatus. It has been known to follow syphilis and malaria, and in a few instances typhoid fever and la grippe seemed to be associated causes. In one of my cases the patient suffered from scarlet fever, was not well thereafter, and two years later developed the typical disease. The disease so infrequently follows the infections, like syphilis, malaria,

typhoid, la grippe, etc., that it is impossible to ascribe any specific relation to it.

In Berlin in ten years there were admitted to the hospital 148,000 patients, of whom 274 were diagnosed as pernicious anæmia, that is about .2 per cent. of all of the hospital cases. It is also stated that 22.4 per cent. of the above cases showed evidences of syphilis. This indicates that a small percentage of syphilitic patients develop pernicious anæmia. It is said, that individuals of a weak constitution and poor development are especially liable to the disease, yet the strong and full-blooded may develop it. The disease occurs more frequently in women than in men. Of the 274 cases mentioned, 172 were women, and 102 men. It may occur at any age, but it is more common in the fourth decade than at any other time in life. It has long been observed that the disease is frequently associated with some disturbance of the digestive tract. This consists in many instances of an atrophic condition of the walls of the stomach and of the intestine, which may become much thinned. The glandular elements of the mucous membrane have been found much atrophied. Achylia gastrica exists in many instances. In carcinoma of the stomach and in chronic glandular gastritis the same atrophy of the stomach wall may occur without pernicious anæmia. An atrophic condition is also found in other portions of the body, and it is not at all unlikely that the condition of the stomach and the intestinal wall has only a contributory etiologic relation to the disease. Intestinal parasites have been found present in the disease, especially the bothriocephalus latus, and the ankylostoma duodenale. The disease, however, does not develop in all cases in which these parasites are present. That they have some relation to the disease is shown by the fact that some patients, who present characteristic blood findings, get well when the parasite is discharged by the patient. The condition of profound

anæmia, with deformed red cells, the presence of fetal red cells in the circulating blood, the presence of an abnormal amount of iron in the liver, together with degenerative changes in the muscles and in the marrow of bone, is a reasonable hypothesis for the assumption of the presence of a circulating poison—a hæmolytic toxin as the fundamental cause of the disease. The source of the poison has been the subject of many theories.

Schauman and Tallquist have brought forward the theory that in cases of pernicious anæmia due to the bothriocephalus latus, the parasite was the source of a toxin because the worm itself was either sick or dead in the host. In this condition the worm was the source of the toxin which produced the anæmia, and explained to these reporters the reason for the non-development of pernicious anæmia in most cases of individuals affected with the bothriocephalus latus. They made the following experiment: The extract or bruised links of the bothriocephalus latus was fed to dogs. In one dog, after two weeks, marked anæmia occurred, the red cells falling from 7,200,000 to 3,400,000.

The view has been advanced that the toxin is of bacterial origin, but no definite observations have been made which would establish this, with the exception of the research work done by Professor Adami and his pupils. In his studies upon hypertrophic cirrhosis of the liver and on hæmochromatosis in pernicious anæmia, Adami advances the opinion that many of the sclerotic processes of the body are due to acute and chronic infection through the presence in the tissues of bacteria or bacterial poisons, which may be derived from the intestines. The organism is successful in overcoming the general infection, but the tissue cells become exhausted through the specific infection, with resulting degeneration and connective tissue hyperplasia. He described diplococcoid forms of bacteria in the stomach and intestinal walls, and in the liver cells, which he believed to

be altered colon bacilli. The suggestion of Adami is very pertinent, especially if one believes that pernicious anæmia is due to a toxin.

More recently Hunter, who had confirmed the observations of Quincke and others as to the hæmolytic effect of a possible toxin, suggested the origin of the poison in the intestinal canal from the altered anatomic condition of the stomach and bowel. Still later, Hunter has suggested the idea that the toxin and the condition of the gastro-intestinal canal have their source in a foul condition of the mouth of the patient, who suffers from pernicious anæmia, and he notes the condition of carious teeth, gingivitis, etc., in many of his patients. It is not improbable that from the evidence we have, pernicious anæmia is due to some hæmolytic toxin, but whether of bacterial or autogenetic origin we cannot at present definitely say.

Symptoms. — The symptoms of pernicious anæmia are chiefly those due to a profound anæmia manifested by weakness, lessened endurance, with dizziness, dyspnœa, palpitation of the heart, etc. The disease is not necessarily steadily progressive, as it is interrupted by waves of improvement. It may be either very acute or chronic in its course, as cases are known to die within a few weeks and others to live for several years. In probably a large percentage of the cases the body weight is preserved, and in a few others there is a loss of weight, and in some emaciation. There is a tendency to subcutaneous, submucous, retinal and other hemorrhages. Gastro-intestinal disturbance is very commonly present, and especially diarrhœa. The appetite is often poor or capricious. There may be a craving for acids, salts, or some other thing with decisive taste. The disease is associated with nervous phenomena in the great majority of cases; usually, however, subjective in character. There is often paræsthesia of the feet, sometimes of the hands. Cerebral disturbance in the form of lessened cerebration

may occur, and Minnich has observed fixation of the pupils, while Bemis, Müller and Nonne report cases of slight facial paralysis, or of one-sided paræsthesia, aphasia, etc.

The spinal cord lesions, which are now recognized as occurring in a small percentage of the cases, may appear as one of the earliest manifestations of the disease, or they may occur late, and may be manifested slightly or not at all up to the time of death. The spinal cord lesions, which will be discussed more fully later, do not always bear a direct ratio to the symptoms. In some instances, with no perceptible spinal cord changes, there may be marked subjective paræsthesias, and even slight ataxia and spasticity, while in other cases, with marked cord changes, the symptoms may be subjective only, and not in keeping with the marked changes in the cord. In the severer degrees of spinal cord lesions, when established, the course of the disease is usually rapid to a fatal ending.

Bastianelli divides the cases into two groups. One in which the pernicious anæmia is the predominant factor, and the cord lesion developing late, with only slight clinical manifestations, or possibly with only subjective disturbances. The second, in which the nervous phenomena develop first or coincidently with the anæmia, the nervous phenomena predominating and overshadowing the symptoms due to the anæmia, and the case rapidly developing into one of paraplegia, with flaccid muscles, loss of sphincter control, bed-sores, and death within a few weeks.

This makes a fairly good division for clinical use, but not all cases can be placed within the two divisions.

During the last few years I have had under direct observation thirty-six cases of pernicious anæmia.

Analysis of my Group of Thirty-six Cases. — Of these, 20 were males, and 16 females. The preponderance of males over females is unusual. The ages were as follows: There were three in the second decennium, seven

in the third, ten in the fourth, nine in the fifth, and seven in the sixth. The youngest was 24 years of age, and the oldest 69. In four cases tuberculosis existed in the family within two generations. In two patients carcinoma existed in the family within two generations. Three of the patients had suffered from syphilis. In two a severe attack of grippe was apparently the cause of an illness which finally developed into pernicious anæmia. One was overcome by smoke and gas at a fire in a large building. One suffered from exophthalmic goitre; fourteen had suffered from diarrhœa as the first manifestation of the disease. Diarrhœa had existed for three years as the longest time, and in one, after an acute attack of diarrhœa, the disease suddenly developed. Constipation, obstinate in character, occurred in two. Nausea and vomiting were present in the majority of the patients at some time in the course of the early stage of the disease. Loss of appetite, amounting in some to complete anorexia, was present in all, and a capricious appetite existed in a few. In twelve repeated examinations of the stomach contents were made after test meals, and disclosed the absence of hydrochloric acid in all. There was enteroptosis of a severe degree in three. The association of grippe with pernicious anæmia has been noted by Bastianelli and by Putnam as a contributory factor in spinal cord lesions. In all patients two or more complete blood examinations were made which gave the characteristic blood condition of pernicious anæmia. Retinal hemorrhages occurred in four; subcutaneous and submucous hemorrhages occurred in eight; epistaxis was a not uncommon factor, and in several bleeding of the gums was observed. Of the twenty male patients, in only three were the teeth bad, and in four only was the mouth in an unhealthy condition. Of the women, the condition of the mouth and teeth was notably bad. In two cases no note was made of the condition of the teeth and mouth; in the remaining fourteen women, either the

teeth were decayed or the gums were infected in all. Of the thirty-six cases paræsthesia occurred early in the history of the case. It appeared simultaneously in the feet and hands in all of these cases, with the exception that in one it was confined to the toes of one foot and to the ulnar border of one hand. In four female patients the anæmia preceded the nervous phenomena by two years and four months, and in two men the nervous phenomena appeared one year and six months, respectively, after evidences of pernicious anæmia were established. In twenty-four of the cases the nervous phenomena were confined to subjective disturbance only, manifested by tingling, numbness, coldness, heat, formication, etc., of the hands or feet, or of both, and in one instance involving the entire lower extremities. Hyperæsthesia occurred in one. Disturbed temperature sense, inability to recognize quickly heat and cold, occurred in two, otherwise objectively the sensation of the feet and hands was normal. In these twenty-four cases the patients complained frequently of discomfort, of a sense of numbness and tingling which were most often present, and usually this condition remained, even when the patients were on a wave of improvement. In only one did it disappear during a wave of improvement, and it reappeared when a relapse occurred. In ten patients the subjective nervous disturbance was associated with a spastic, and usually with an ataxic condition, which grew steadily worse, and in three developed into complete flaccid paraplegia, with loss of knee jerk, loss of voluntary bowel and bladder control, and the development of œdema and bed-sores. One died while in a state of spastic paraplegia. Four are living with spastic ataxic paraplegia, and very troublesome subjective sensory disturbances. One case died with simple sensory disturbances only without ataxia, spasticity, or paraplegia, whose spinal cord showed dorso-lateral sclerosis. One died with all the evidences of insanity, but a post mortem was not obtainable.

Burr states that a girdle sensation is never present in the spinal cord lesions of pernicious anæmia. Girdle sensation was present in all of the cases which developed spasticity in my group. As observed by Putnam, some of the patients complained of a peculiar paræsthesia of the mouth. One complained of a sensation as if his mouth contained threads of hard cotton; another that his mouth had the sensation of dryness, although saliva was present; another of a sense of burning which cold water did not allay. The sexual power of the males was uniformly diminished. Menstruation ceased, as a rule, in all of the younger women. Severe spinal cord lesions occurred in the female cases, in the relatively young. One was thirty-nine, one forty, one forty-seven, and one thirty-four years of age. In the males severe cord symptoms occurred in one individual of thirty-six, another of forty, in two of fifty-six, in one of twenty-six, and in one of sixty-two.

Case 1. — Female; aged 60; a copyist; the mother of two children; was admitted to Cook County Hospital in my service on September 8, 1899. The patient stated that for six months she had had great weakness, with faintness, shortness of breath, palpitation of the heart, cold extremities, and general nervousness. She had twice had severe nosebleed. There had been no loss of weight, but she had become so weak that she was finally obliged to remain in bed. She complained of numbness of the hands and feet, with a sense of burning.

Examination showed a lemon-yellow pallor, with pale mucous membranes, and some œdema of the eyelids and of the ankles. The radial pulse was small, rapid, compressible and weak. There was a soft systolic murmur at the base of the heart, which was transmitted into the vessels of the neck. A venous hum was heard in the neck. The spleen was palpable, and the liver extended two fingers' breadth below the costal arch. The pelvis was negative.

The urine was normal. The temperature was slightly elevated, and the patient stated that it had been so for two days following an attack of diarrhœa. The stools were watery and loose, but contained no parasites. The blood showed 960,000 reds; 25 per cent. hæmoglobin; 3,000 white cells; 36 mucleated cells were estimated per cubic millimeter, of which 12 were megaloblasts, 12 microblasts, and 12 normoblasts. The knee jerks were normal. There was no ankle clonus, and no objective sensory disturbance of the skin. The eye grounds were normal. The patient, with rest and simple food and restorative tonics, gradually improved and left the hospital after one month. She again came under my care at the Presbyterian Hospital on the 26th of March, 1901, and remained under observation constantly until the time of her death, on the 24th of July, 1901. Frequent examinations of the blood were made, which showed the typic condition of pernicious anæmia, with waves of improvement and decline until the death of the patient. The stomach contents, examined on several occasions, showed always absence of hydrochloric acid. No bacteria were ever cultivated from the stomach contents. The stools showed no parasites at any time. The patient complained a great deal of a sense of numbness and tingling and burning in the feet, and of numbness and tingling in the fingers, but beyond this there was never any evidence of a disease of the nervous apparatus. She died after two days of unconsciousness, without fever, and without the occurrence of any acute infection.

A post mortem was made by Professor LeCount, of Rush Medical College, nine hours after death. There was atheroma of the coronary arteries and of the aorta; parenchymatous degeneration of the myocardium, which was very pale; hydropericardium; œdema of the lungs; hyperplasia of the spleen and liver; fatty degeneration of the liver; follicular enteritis and colitis; ascites; general anæ-

mia; icteroid pigmentation of the whole body, and sclerosis of the posterior and lateral columns of the spinal cord, which were examined histologically. A complete histologic examination was made of all of the organs of the body, which showed degenerative changes in the blood vessels, in the heart muscle, the liver, in which there was also an increase of the iron by Quincke's test, of the spleen, atrophy of the stomach and intestinal walls, with follicular degeneration of the mucous membrane of the intestine, and lymphoid degeneration of the marrow. The marrow contained red cells, normoblasts, and megaloblasts, and irregular and spindle-shaped cells.

Histologic changes of other organs are unimportant, and are omitted for the sake of brevity.

Sections of the spinal cord were stained by Marchi, Van Gieson, toludin blue, and Weigert-Pal methods. Slight sclerosis was observed in the lateral tracts in the lower lumbar, which increased gradually as one passed upward into the upper cervical region. Slight sclerosis was noted in the posterior median columns in the mid-thoracic region, which was increased to a maximum in the cervical swelling. Above this point the sclerosis gradually disappeared, and at the junction of the cord and the medulla had entirely disappeared, as is shown in the accompanying figures. In the thoracic cord the Nissl bodies of the anterior horn cells were normal. The blood vessels of the cord contained many lymphocytes, and many others leucocytes. The walls of the blood vessels were unchanged. In Clarke's nucleus the nuclei were centrally placed, and the Nissl bodies stained normally. In the cervical swelling there appeared to be a slight breaking up of the Nissl bodies in the anterior horn cells; otherwise the condition was the same as that in the thoracic cord. Spinal roots, ganglia, pia and vessels normal. (See cuts of Case 1.).

The cerebral cortex showed normal cells and Nissl bodies.

This case is one which belongs to the group described by Lichtheim, Nonne, and Minnich, and would belong to the first group as classified by Bastianelli. Contrary to the rule, the lateral tracts were more extensively involved than the posterior, although the process extended to a severer degree in the posterior than in the lateral tracts. The microscope showed very definitely in this case the cribriform result of a falling out of the degenerated nerve fibres in the lateral columns without a glia increase. In the cervical swelling the neuroglia increase is evident with resulting sclerosis.

Case 2.—Female; aged 39; American; has borne four children; was admitted to the Presbyterian Hospital on July 26, 1900. Her mother died of paralysis, the nature of which the patient does not know. Her father is still living, but has suffered from stomach trouble a great deal of his life. One maternal aunt died of cancer. One brother and seven sisters are living and in good health. The patient has worked hard, and has always been in good health until the birth of her last child. Two of her children are living, and two are dead. One was still-born. Her present illness began seven years ago, after the birth of her last child. She suffered from indigestion with gaseous eructations, acidity, with fullness in the epigastrium after eating. Occasionally there was vomiting, which had no relation to the meals. She never vomited blood. The appetite was variable; sometimes it was good. She had diarrhœa, with watery stools, which often contained undigested food, for the first six weeks of her illness. She was weak, and a noticeable pallor occurred a year ago. She does not remember when her first nervous symptoms occurred, but states that recently she had had a sense of numbness about the hands and feet, with irritation of the bladder which required her to urinate frequently. There was also a sense of pressure in the rectum, and sometimes

pain, especially if the bowels were constipated. Menstruation ceased four months ago. Her strength and endurance have been gradually lost. She noticed the legs were becoming weak during the fall of 1899, and after December, 1899, she was obliged to remain in bed. Her legs became gradually weaker, and she finally lost complete control of the bladder. Her bowels were usually constipated, and required a laxative or the injection of water to move them. The pallor, she states, increased, and there was a decidedly yellow tint to the skin.

Examination revealed a woman fairly well nourished; skin icteroid and pale; mucous membrane very pale; the tongue indented and furred; no carious teeth, and the gums healthy. The chest negative, excepting for a soft systolic blowing murmur heard in the mitral and pulmonic areas. Pulse, 100 per minute, small and soft; the belly of pot form, with diastasis of the recti muscles. There was very palpable visceroptosis, including the liver, kidneys, spleen, intestines, and stomach. The uterus was retroverted and moderately fixed. Rectum was normal; the eye grounds were normal. There were slight bedsores over the sacrum; the patient lay in bed with the thighs and legs flexed and closely approximated. There was some atrophy of the muscles of the lower extremities, chiefly of the extensor groups. The knee jerk was increased; there was slight ankle clonus, more of the left than of the right; Babinski's sign was present in the right, but not in the left. There was slight anæsthesia of the feet and legs; muscular sense was absent; there was some disturbance of the temperature sense in certain areas, where both heat and cold were felt as touch only. There was a small area in the left inguinal region and upon the outer surface of the right thigh where heat was felt as pain. There was a noticeable loss of power in the legs, and this was more marked in the right than in the left. The sphincters of the rectum and bladder were

relaxed. The muscular power and sensation of the skin in the upper extremities seemed normal. The patient complained of a sense of constriction about the abdomen in the waist line. The eye grounds were normal. The stomach contents contained no hydrochloric acid. The urine was normal. The blood showed 610,000 red cells; 20 per cent. of hæmoglobin, and 3,200 whites. Poikilocytosis was very marked, and there were many nucleated cells, the megaloblasts predominating. The patient remained in the hospital from that time until the date of death, February 27, 1901. Repeated blood examinations confirmed the diagnosis of pernicious anæmia. The spinal cord involvement increased; and finally resulted in flaccid paraplegia. The patient's mental condition remained fairly clear, although she did not apparently recognize the gravity of her condition. The arms became finally ataxic, although the patient was, at all times, able to feed herself and to button her clothes; but there was a distinct loss of power in the upper extremities. The sensations objectively remained normal, which was a most curious phenomenon when one notes the condition of the cervical spinal cord. There was at no time any disturbance of the eye grounds, nor of the oculomotor muscles. The appetite remained fairly good; the patient vomited occasionally. The stomach contents showed no hydrochloric acid upon repeated examinations. During the latter part of the patient's illness she developed a cystitis, and later a pyonephrosis. As a result, there was an irregular type of fever, with a rapid pulse, until death closed the scene.

The post mortem examination was made by Professor Hektoen, of Rush Medical College, at the Presbyterian Hospital two hours after death. There was general anæmia; red marrow in the femur; splenic hyperplasia; ascending cysto-uretero-pyelonephritis; broncho-pneumonia; fatty liver; sclerosis of the aorta; chronic pelvic peritoni-

tis, with tubo-ovarian adhesions; extensive sacral decubitus, œdema of the feet, and degeneration of the postero-lateral columns of the spinal cord. The microscope revealed the usual extensive atrophic and fatty degeneration of the organs of the body, and the liver an increase of iron by the Quincke test. For the sake of brevity, I will omit a further histologic description of the organs, excepting of the spinal cord. Sections of the spinal cord were stained with toludin blue, VanGieson and Marchi. The Weigert-Pal method showed degenerative changes, with absence of the myeline sheath from many of the tracts. At about the fourth lumbar, the posterior column was invaded, leaving, however, normal white tissue in proximity to the gray matter and presenting undegenerated the oval bundle of Flechsig. The lateral tracts showed degeneration in the right more than in the left. In the lower dorsal region the degeneration had become more extensive, involving almost completely the posterior columns, but leaving a narrow normal band of white tissue next to the gray commissure and posterior horn; the lateral tracts were almost equally involved, and one direct pyramidal tract, showing extensive degeneration. The posterior root zone and the column of Lissauer remained normal. In the mid-dorsal region the sclerosis was very extensive, involving, to a greater or less extent, the complete periphery of the cord. The sclerosis still left a slight band of tissue next to the gray commissure, and a larger band along the posterior gray horns. The columns of Goll and Burdach were almost completely involved, while in the lateral column the pyramidal tract, the direct cerebellar tract and Gowers' tract were sclerosed. Both direct pyramidal tracts were implicated. In the cervical swelling the posterior column, and in the lateral columns the pyramidal tracts, the direct cerebellar tract, and in the anterior column the direct pyramidal tracts, were extensively sclerosed. Here, again, the root zone and the

column of Lissauer were practically free. At the junction of the cervical cord and the medulla one pyramid was extensively involved, while the other one but slightly degenerated. Both direct cerebellar tracts were degenerated. The column of Goll was entirely degenerated, except at the gray commissure. The medial and posterior parts of the column of Burdach were completely degenerated, while the lateral portion was unchanged. The spinal tract of the trigeminus was not affected. In the lower medulla one pyramid was much degenerated, the other slightly so. The upper extremity of Goll was completely degenerated. The column of Burdach, excepting a small triangular area, between the nucleus of Burdach and the posterior horn, was degenerated. The internal arcuate fibers, which go to the lemniscus, were normal. In the medulla the pyramids were practically normal, there being only a slight, if any, degeneration. The white matter around the spinal extremity of the olive was normal. The internal arcuate fibres and the interolivary layer of the lemniscus were normal; likewise the external arcuate fibres. In the upper medulla the white fibres of the hypoglossal nerve were normal. Both pyramids were slightly and diffusely degenerated, more upon one side than upon the other. The white cap of the olivary body was normal. The olivary fibres to the restiform bodies were normal. The restiform bodies were normal. The tractus solitarius was normal. A section through the lower pons showed a marked degeneration of both pyramids, one slightly more than the other. This is remarkable, because of the absence of degeneration in the pyramids of sections below. The posterior longitudinal bundle was normal. The middle cerebellar peduncle was normal. The upper pons in the dorsal region showed the normal stain; the posterior longitudinal bundle was well marked. The central tegmentary path appeared normal. The medial and lateral lemniscus were normal, as was also

a section of the superior cerebellar peduncle. In the ventral pons long fasciculi, including the fibers of the pyramidal tract, and those from the cerebrum to the pons, appeared normal. The transverse fibers of the pons stained intensely. This section showed a light line in its most ventral part, which may be an artefact. In the thoracic cord the anterior horn cells and the Nissl bodies in the centre were round and granular, while in the periphery of the cell the Nissl bodies were spindle-shaped and stained normally. In Clarke's nucleus cells were small and much less in number. The cells of the lateral horn showed disintegration of the Nissl bodies. The blood-vessels contained leucocytes, but in smaller number than in Case 1. In the cervical region the Nissl bodies were in the same condition in the anterior horn as in the thoracic cord; they were spherical and fairly granular instead of spindle-shaped. Lipochrome masses filled up the cells and pushed the Nissl bodies towards the periphery. The blood-vessels were only slightly thickened. Section of the cortex showed that the pyramidal cells stain and have normal stainable Nissl bodies. (See cuts of Case 2.)

The cells of the cerebral cortex were normal.

The accompanying microphotographs of sections of the entire cord, medulla, and part of the pons, speak more definitely than words of the extensive degenerative process which occurred. It is remarkable that the nervous symptoms, especially of the upper half of the body, were so mild, as compared with the lesions of the upper cord and medulla. The absence of any marked degeneration of the gray matter, of the root zone, of the root ganglia, and of the brain cortex, agrees with the reports of others and illustrates the fact that a whole neuron, either afferent or efferent, is not involved. It is further remarkable that the lesion varies so in its extent, both lateral and vertical, in the cord; that the degeneration, especially in the anterior pyra-

mids, appears and disappears at different heights; that the degeneration is greatest in the upper and lower cervical regions, as in many of the cases reported by others. Still here, as elsewhere, in the cord, it is not confined entirely to any one of the different cord systems. A chronic degenerative process, manifested by nerve degeneration and glia increase, occurs in some part of the cord, while in other parts there is a rapid process of nerve fibre degeneration and destruction without much glia increase, leaving a cribriform-like appearance.

BOSTON MED

Case 3. — Was admitted to the Presbyterian Hospital, Chicago, April 12, 1902, in the service of Prof. James B. Herrick, who very kindly permitted me to report it. Female; aged 47; married; mother of one child, has had one miscarriage, which she says was caused by overwork. Her mother died at 62 of Bright's disease. Her father is living, at the age of 74. Ten of the eleven children of her parents' family are living, and all in good health except herself. One brother died as the result of a severe injury; one uncle died of tuberculosis, and two uncles died of kidney disease. The patient suffered from the usual diseases of childhood. Her menses were established at thirteen, and were always regular. She was married at the age of thirty. Her health has always been good. She had some stomach trouble six years ago for about three months, and from which she recovered and remained well until a year ago, at which time she observed a numb feeling in the fingertips, which increased and has remained until now. Three months later there appeared a sense of burning in the lower extremities, and the feet and ankles swelled slightly. During the last summer she noticed she was losing strength and had a poor appetite. She became pale, although she states that she has never had a good color. Six months ago her skin became yellowish. For a year she has had a sense of fullness in the stomach after meals, but never pain.

No nausea or vomiting. The bowels have been constipated. She has grown steadily weaker, and especially during the last six or seven weeks has been unable to go about. During the last year the patient says she has lost forty-five pounds. She complains at this time of numbness and tingling in the hands and forearms and her fingers feel like sticks of wood when she strikes them against objects. She has lost all power in the lower extremities, with a sense of pressure and tenderness in both groins. The legs are flexed on the thighs, the thighs upon the abdomen, and the knees are held closely together. There is some cramp-like pain in the thighs, periodic in character. There is a sense of numbness in the lower extremities. She cannot tell the position of the limbs without looking at them.

Examination. — The patient is fairly well nourished. There seems to be but little loss of subcutaneous fat; the skin is yellowish-white; the skin of the lower extremities appears waxy. There is a considerable œdema of the feet and ankles. The mucous membranes are very pale; the teeth are in bad condition; the gums are sore. The chest is negative, excepting for a hæmic murmur over the base of the heart. There is considerable tenderness on pressure in the middle of the sternum. The abdomen is tender upon pressure everywhere. The lower extremities show considerable atrophy of the muscles; the flexors are soft and flabby, while the adductors and extensors are contracted. The knee-jerks are increased: ankle clonus is present; Babinski's sign is absent. The sense of touch is everywhere acute. Temperature sense of the feet and legs is impaired; pain sense is acute over the skin of the lower extremities. The muscle sense is impaired in both the upper and lower extremities. There is apparently no loss of strength in the upper extremities, but the patient cannot tell the nature of objects placed in her hands, and they are often dropped to the floor. Patient is unable to stand or walk. The pupil-

lary reflexes are normal; the eye grounds are unchanged. Stomach contents shows absence of hydrochloric acid. The urine is normal, excepting for a trace of albumin. The patient was very weak, with a temperature ranging from 99½° to 101°, and pulse from 100 to 112. There was no appetite. Patient was able to digest without great discomfort the food that was given her.

On April 25, a blood examination showed 1,248,000 reds; 30 per cent. hæmoglobin, and 4,400 whites; many nucleated cells were found, including a preponderance of megaloblasts. Practically the same blood condition was found on May 7. The final blood examination, on May 17, showed 912,000 reds; 29 per cent. hæmoglobin, and 4,200 whites. The patient's general condition became gradually worse; the lower extremities, while practically paralized, were never entirely flaccid. The patient did not lose control of the bowels or of the bladder, although it was necessary to catheterize the bladder at times. She suffered from considerable pain in the lower extremities, and there was a gradual loss of power in the arms and hands. She died on the 20th of May. An autopsy was held one-half hour after death by Dr. Bassoe, the resident pathologist of the hospital. There was general anæmia, with œdema and atalectasis of lower lobes of both lungs; fatty liver and heart; chronic interstitial nephritis; atrophy of the mucosa of the small and large intestines; atheroma of the aorta; ecchymoses of the dura mater; œdema of the lung; and degeneration of the posterior and lateral columns of the spinal cord.

Sections of the spinal cord stained with Weigert-Pal, Marchi, vanGieson, and toluidin blue showed extensive sclerosis of the posterior columns of characteristic outline. In the upper lumbar the process involved the middle portion of the posterior column and left normal white tissue along the gray commissure and posterior horn, and in the

lateral columns involved the crossed pyramidal tracts. The column of Lissauer and the root zone were, as usual, free. The spinal gray, including the column of Clarke, was free. At the level of the second thoracic the process was very extensive in the posterior columns, but left a narrow band of apparently normal white tissue next to the gray commissure and along the posterior horn. The sclerotic process was dense about midway between the commissure and the periphery, and on each side next to the septum. The sclerotic process involved also the greater portion of the lateral tract, extending forward as far as the gray commissure. There was apparently slight degeneration, also, in the anterior pyramids, more upon one than the other side. At the level of the fourth cervical the sclerotic process was about the same as at the second thoracic, but was more extensive in the posterior columns, with a greater amount of sclerosis. A narrow band of white normal tissue was still left along the posterior horns and the gray commissure. The column of Lissauer and the root zone were free. The direct pyramidal tracts were apparently slightly implicated. The process in the lateral tract was not quite as extensive as at the lower level, but involved the crossed pyramidal, the direct cerebellar, Gowers' tract, and extended diffusely into other portions of the lateral tract. There was no thickening of the blood-vessels; no hemorrhages were found, and there were no evidences of meningitis. The ganglia and the posterior roots were normal. The degenerative process in this cord does not differ histologically from that of Case 2, or from that described by Taylor and others. The two processes so often mentioned are typically seen: The one a cribriform-like arrangement, as if a degenerated nerve and sheath had dropped out, leaving a sieve-like neuroglia meshwork, while in other portions an evident glia increase is noted, with a sclerosis corresponding to it. (See cuts of Case 3.)

The cells of the cerebral cortex were normal.

General Remarks upon the Cord Lesions of Pernicious Anæmia. — These three reported cases illustrate very typically the sclerosis of the spinal cord which has been described by so many writers as characteristic of pernicious anæmia. This consists of a sclerosis of the posterior columns, either alone or associated with a like change in the lateral tracts of the cord. The lesions in the posterior and lateral tracts are most marked, as a rule, in the upper thoracic and lower cervical regions. From this point the degeneration usually diminishes, as one passes downward in the cord, to disappear in the lower lumbar region. It also diminishes as one passes upward into the medulla. The sclerosis is not confined, however, to these two systems. In the lateral tract it may not involve the whole of the crossed pyramidal, and may invade at the same time other portions of the lateral tract wholly or partly. The crossed pyramidal tract may be free. It is not always diffuse, but may occur in focal areas, not necessarily symmetrically distributed. The anterior pyramids may be involved at different heights, not always symmetrically. Case 2 is a good example of the focal distribution, as the degenerative areas are seen to appear and disappear at different heights in the anterior pyramids. The case is also a good example of the diffuse type of the disease, inasmuch as in certain areas, at certain heights, it is very diffuse, and in others it involves the whole or part of a tract. The process is thus characterized by the fact that it does not involve apparently a whole system centrifugally or centripetally, at all levels of the spinal cord. It is apt to diffuse itself from one tract into another, especially where it is most extensive, as in the upper thoracic region. The spinal gray is usually not involved, although in a few cases reported a note is made of slight hemorrhages into the gray matter and of thickening of the walls of the blood vessels.

At most, there has been found some over-pigmentation of the Nissl bodies, and a diminution in the cells in the column of Clarke.

Another characteristic of the sclerosis is the fact that the whole neuron is not involved. In the reports made by most writers the posterior ganglia have been found unaltered, and the posterior root zone is practically always free. The cells in the anterior gray horns are practically unchanged. Mott reports two cases in which he states he found degeneration of the cells of the cortex, associated with descending degeneration downward through the pyramids, but the great majority of reporters have found the cells of the cortex practically normal. The process is usually not attended with degeneration of the peripheral nerves, although a few individual cases have shown slight changes in the axis cylinders. The process is, therefore, one in which certain systems are partly involved, with a tendency for the degenerative process to diffuse itself through other tracts at certain levels. It cannot be called systemic, because an entire system is not involved, nor is a whole neuron implicated in the degenerative process.

E. W. Taylor, in a paper by Putnam and Taylor *(loc. cit.)*, has given a most classic description of the pathologic histology of the spinal cord in pernicious anæmia and other conditions which have been referred to. I would, therefore, refer those, who desire an extended description of the cord in these conditions, to that paper. For the reasons given by Taylor I have adopted the term diffuse degeneration of the spinal cord for the lesions under discussion. It is sufficient to say here that all reporters describe the degenerative process as apparently of two kinds, one of which seems to be more acute, consisting apparently of a process in which the nerve sheath becomes swollen, stretched, and filled with debris, consisting chiefly of fat droplets. This process is not usually attended with an increase of neuroglia, and in

consequence the degenerated nerve sheath and fibre and its products are absorbed, leaving a vacuolated appearance, in which sometimes a normal or relatively normal axon may be seen. This process is beautifully shown in Case 1, in most of the figures, and in many figures of Cases 2 and 3.

Another more chronic process occurs, apparently coincidentally, in which there is an associated glia increase, with sclerosis, although contraction does not occur apparently, as in some other sclerotic processes of the cord. These two processes are often seen side by side, the one apparently chronic, with a tendency to neuroglia proliferation; the other acute, and sometimes very extensive. The more active process may explain the sudden occurrence of severe symptoms which sometimes takes place in the course of the disease. Bastianelli has maintained that the sclerosis in pernicious anæmia is not as compact as in the diffuse degeneration due to other conditions. In Case 1 of my series this sclerotic process was very dense in the upper thoracic and lower cervical regions in the column of Goll (see figure), and in the other two cases that were typical examples of pernicious anæmia, in which both processes were present, the sclerosis at some levels was very dense.

Causes of Spinal Cord Degeneration.—The lesion in the spinal cord has been attributed by different writers to the following causes:

1. To multiple hemorrhages, such as may occur under the skin and elsewhere in pernicious anæmia. This is not supported by the conditions found, for the reason that in many instances the lesion is diffuse, and does not extend upward from a possible hemorrhagic focus of degeneration in one tract, and downward in another, as it would necessarily do if the degeneration started from such a hemorrhagic point.

2. To thickening of the walls of the blood vessels. This cause of the degeneration has been especially advanced

by Nonne and by Minnich. They have reported hyaline degeneration and thickening of the walls of the blood vessels, with an exudate into the perivascular space. Most reporters have not found any marked thickening of the blood vessels, certainly not sufficient to be the cause of the degenerative process; and, furthermore, the process is usually not as diffuse and not as often focal as it would be if the primary cause of the disease was due to an arteriosclerosis. With thickening of the walls of the blood vessels, as found, it is just as probable that it is a part of the general sclerotic process.

3. To acute myelitis, which has been ascribed by Leyden as the cause of the disease in its earliest stage. No round-cell infiltration is found, and the distribution is too irregular, the spinal gray practically always free, which would rationally exclude myelitis.

4. To a primary change in the gray matter of the cord, of the brain, and of the ganglia. As stated, Mott has reported two cases in which he found degeneration of the large cells of the cortex, but the majority of reporters have not found complete neuron degeneration, and in the great majority of cases the spinal ganglia, the brain cortex and the spinal gray have been found healthy.

5. To anæmia. Poverty of blood alone is probably not the cause, for the reason that similar lesions do not occur in grave secondary anæmias. So far as any experimental work regarding secondary anæmias is concerned, chronic degenerative cord lesions have not been produced, and Mott states that chronic spinal cord changes cannot be produced experimentally. Furthermore, Bastianelli states that he and his colleagues have never found changes in the spinal cord in many cases of grave secondary anæmias due to malaria, although careful examinations, both macroscopic and microscopic, of the cord and brain, have been made.

6. To a toxic agent. The consensus of opinion is that

the nervous lesions are due to a toxic agent, which is also responsible for the anæmia when it is present. The fact that the lesion does not involve, as a rule, a whole neuron or system; that the trophic cell is usually not disturbed in either the cortex, the spinal gray, or the posterior ganglion, and that the ultimate primary change is one of degeneration of the nerve fibre itself, speaks for the effect of some blood-circulating toxin. The fact, too, that the brunt of the lesion occurs in that part of the tracts involved farthest removed from the trophic center, where the nerve fibre is the least protected by its nutritive cell, is evidence of a toxic cause.

The Degenerative Processes of the Spinal Cord in Other Conditions than Pernicious Anæmia.—As stated above, diffuse spinal cord lesions similar to those of pernicious anæmia have been reported by Putnam, by Dana, by Russell, Batten and Collier, and by others. Indeed, the now classic ataxic paraplegia of Gowers does not differ essentially, as one notes his description of it, from the reported condition of the cord of many of the writers upon the subject of this paper. Gowers says that the posterior and lateral columns are both affected, but usually less intensely in the lumbar than in the thoracic cord. He notes that the root zone is not as often affected as in tabes; that the degeneration does not reach the posterior periphery of the cord, and that the degeneration of the lateral columns is not often systemic in character. In many cases reported by Putnam in his first paper, and by Dana, the degenerative process is so similar to that described, especially in the severer degrees of degeneration found in pernicious anæmia, that one could rationally say the processes were the same. Putnam noted degeneration in the spinal gray in some cases in his first paper, but in his second paper with Taylor emphasis is placed upon the fact that the gray matter, the spinal ganglion, and the superficial nerves are usually not

involved. In thirty-eight of Putnam and Taylor's fifty cases, six only were noted to have pernicious anæmia. Of the nine cases reported by Russell, Batten and Collier, two only had pernicious anæmia, and in the nine cases reported by Burr, two did not suffer from pernicious anæmia. In all of these cases the spinal cord changes were practically the same, differing only in the degree of the spinal cord involvement. Indeed, Russell, Batten and Collier divide the cases clinically into three stages. The first, in which the patient is paræsthetic, with possibly slight ataxia and spasticity; the second stage, in which is added an increased ataxia and spasticity, with increased knee jerks, and slight paraplegia; and a third stage of flaccid paraplegia, with absent knee jerks, loss of sphincter control, bed-sores, emaciation, etc. A patient dying in the first stage of the disease would show usually less marked degenerative lesions than would one of the second or of the third stage.

This division of the cases clinically, while practical for study, is one which cannot be fully maintained, for the reason that all cases do not pass to the stage of even spastic paraplegia. Case 1 of my series died with symptoms only of subjective paræsthesia, and yet the spinal cord changes were sufficiently marked to have produced marked spastic, if not paraplegic, symptoms. Case 3, too, did not show flaccid paraplegia at the time of death, although the spinal cord changes, as shown by the figures, were very marked.

Spinal cord degenerative changes have been noted also in other conditions than those reported above. Williamson reports two cases of diabetes mellitus in which there was sclerosis of the nerve fibres in the posterior columns, especially in the column of Goll, with a moderate increase of neuroglia. Nonne quotes Tuczek on sclerosis of the posterior and lateral tracts in pellagra poisoning. This occurs as a symmetrical degeneration, and includes usually the column of Clarke, but the membranes of the cord remain free. It

is a chronic disease, with remissions and exacerbations, and may be mistaken for amyotrophic lateral sclerosis, ataxic paraplegia, or hysteria. Nonne reports two cases of leukæmia in which there was sclerosis in the middle column of Goll and Burdach, greatest in the dorso-cervical region but for a few small areas in the lateral and in the right pyramidal tract. There was no change in the spinal gray, in Clarke's column, in the root zone, in Lissauer's tract, or in the blood vessels. Nonne calls atention to the fact that this differs from the changes of pernicious anæmia, in that in the latter he has always found disease of the vessels of the spinal cord. Nonne also quotes Walter Müller, who reports a case of leukæmia, with spinal cord changes similar to those described by him. E. Bloch and H. Hirschfield report a case of myelogenous leukæmia, in which the cord showed moderate sclerosis of the posterior and lateral columns, greatest in the cervical region, and diminished from above downward. They quote a case by Kast of myelogenous leukæmia in which there was some sclerosis in the medulla, but none in the cord. They also quote Minnich, who reported a case of myelogenous leukæmia, with cord changes of a degenerative character, which he attributed to œdema consequent upon the anæmia. Similar cord changes have been found in diphtheria, lathyrism, and in certain metallic poisoning, like phosphorus, lead and arsenic.

It must be evident to one who has had experience with pernicious anæmia, and who is familiar with the literature of the subject of diffuse degeneration of the spinal cord as it occurs in pernicious anæmia and other conditions, that there is a marked similarity of the contributory causes of pernicious anæmia and of the conditions which are mentioned as causative in the production of the spinal cord lesions of other conditions. For example, in Putnam's first report he notes the age, the sex, the nutritional condition, the general feebleness and lack of vigor, the pre-existence of

infectious disease, like la grippe and typhoid, the developmental fault, the neuropathic history of epilepsy, goitre, etc., and the existence of chronic gastro-intestinal disease as important factors in his cases. These very conditions are prominent elements in many of the cases of pernicious anæmia. The consensus of opinion, as stated, is that pernicious anæmia is due to a hæmolytic toxin, and it is the universal belief, too, that the degenerative changes of the spinal cord in these different conditions are due to a toxin. It is suggestive, therefore, that possibly a toxin, which has its origin perhaps in the way suggested by Adami, may be one which may have in certain individuals a predilection for hæmolysis; in another for degeneration and sclerosis of tissue which, by election, affects the liver in one case, the kidney in another, and certain parts of the spinal cord in another. We recognize tabes as a parasyphilitic disease, and believe that the toxin associated with syphilis has a predilection for the posterior columns. It affects but a small percentage of syphilitic cases. Our want of knowledge of the nature of the toxin or toxins makes a discussion of this part of the subject purely theoretic, and of no value, although perhaps interesting. It is clear, however, that the future study of these degenerative processess must lie in the direction of an attempt at discovering the source and nature of the probable toxin, not only of pernicious anæmia, but of the degenerative changes of the cord in other conditions.

CONCLUSIONS.

The conclusions which one may draw from a study of the subject are:

1. That there is a well-established relation of diffuse cord degeneration with pernicious anæmia.

2. It seems probable that the hæmolysis and the cord changes are due to the same toxin.

3. While the source of the toxin is unknown, the fact

that gastro-intestinal disturbance is so common in the disease would lead one to suppose that it is of intestinal origin.

4. The diffuse degenerations of the spinal cord which occur in conditions without pernicious anæmia do not appear to differ essentially from those of pernicious anæmia.

5. It is possible that a common blood circulating poison exists which may expend its force upon the blood in one individual, upon the nervous apparatus in another, and coincidently upon the blood and spinal cord in others.

Note—I desire to here express my appreciation of the aid afforded me by Professor L. F. Barker of the University of Chicago, in examining sections of the spinal cord; to Dr. J. F. Smith of the House Staff of the Presbyterian Hospital, and to Drs. Robinson and Bassoe for aid in preparing sections of the cord.

APPENDIX.

Case 4. — Female; aged 34; American; married; has borne one child. Had a miscarriage at one time, but cause unknown. Patient comes from a neurotic family, but there is no history of any grave inherited disease, either nervous, malignant, or tubercular. There is an uncertain history of acquired syphilis.

The patient was first seen May, 1898. She complained of a feeling of weakness, which had begun about a year previously. Her endurance was very much less. There was some gastro-intestinal disturbance, but apparently this was of no importance and depended somewhat upon the nervous condition of the patient. She had had considerable worry and fret concerning domestic affairs, and was neurasthenic.

A blood examination revealed 2,800,000 red cells; 40 per cent. hæmoglobin, and 8,000 white cells per cubic millimeter. This represented a rather severe secondary anæmia. No plasmodia malariæ were found. The spleen was palpable. There was a slight eczematous eruption in the axilla and about the pubic region. The urine was light in

weight, but contained no abnormal ingredients. There were no subjective or objective nervous disturbances referable to the spinal cord. No definite diagnosis was made. Patient was placed upon arsenic and iron and general hygienic treatment.

She was seen again in the fall in 1898, and at that time complained of weakness of the lower extremities, associated with paræsthesia. There was tenderness over the anterior crural nerve and some branches of the sciatic. The knee jerks were present, but not increased. Patient had good control of the bladder and the bowels. Tactile, temperature, and pain sense were objectively normal. The anæmia was of practically the same grade as when seen in the preceding May. The patient was not seen again until August, 1899, when she presented marked evidences of paraparesis, associated with paræsthesia of the skin of the lower extremities. There was marked diminution of the tactile, temperature, and pain sense, and partial loss of control of the bladder. Marked ataxia of station and locomotion was present. Knee jerk was entirely lost; the Argyll-Robertson pupil was not present; the fundi were normal. The temperature was subfebrile, ranging to about 100° in the evening; pulse from 90 to 100. From the middle of August the patient grew worse, with rapidly diminishing power in the lower extremities, until complete flaccid paraplegia resulted, with loss of control of both the bladder and bowels.

On August 31, a blood count showed 34 per cent. hæmoglobin; 1,010,000 red cells; 6,000 white cells, with 228 nucleated cells per cubic millimeter, of which 189 were megaloblasts. Poikilocytosis and polychromatophilia were present. The paralysis extended upwards, involving successive segments of the cord, with the corresponding nerves, and she died in September, 1899, with involvement apparently of the respiratory and cardiac centers.

Unfortunately, a post mortem examination could not be obtained. But the history is one of chatacteristic spinal cord degeneration occurring in pernicious anæmia, and the case would naturally fall into the second group of Bastianelli's cases. The anæmia for the first year or more was certainly not of a pernicious type, although it was grave. But preceding death the blood find was typical of pernicious anæmia. Like other cases reported, the progress was very rapid, when the nervous symptoms became marked by the paraparesis, and in the later stage the whole appearance of the patient, together with the blood find, was that of a rapidly progressing pernicious anæmia, with paralysis.

Case 5. — Male; aged 56; laborer; was first seen and examined on December 2, 1901. The family history was good, and the patient's habits were unexceptional. He dedenied venereal disease. Had always been well, and worked hard up to the beginning of his last illness. For eighteen months he stated he had grown gradually weaker in all the muscles of the body, but especially in the lower extremities. Ten months before he had noticed tingling and numbness in the left hand, and though he had frozen the fingers, the right hand soon became affected in the same way. The disturbance did not extend above the wrist. Five months ago the same sensation of numbness and tingling in the feet, legs and thighs, and a constricting band was felt about the waist. In August, 1901, Dr. F. A. Stephens, of Belmond, Iowa, made an examination of the blood, which showed 2,000,000 red cells, and 65 per cent. of hæmoglobin. About the middle of December the Doctor found 4,120,000 red cells, 85 per cent. hæmoglobin, and 7,500 white cells. Color index in both of these examinations was higher than normal. The patient has been taking arsenic for four months. For the last two or three months the patient has noticed some difficulty in walking. His gait is uncertain, but he can control it by

close attention to the feet, and he has never fallen. He has no more difficulty in getting about in the dark than in the light. He has good control of the sphincters of the bladder and bowels, but there is, he says, not the normal feeling during micturition and defecation. There has been no disturbance of the gastro-intestinal tract. His weight is 135 pounds, the average normal. Examination showed a man of rather aged appearance, with a slightly icteroid pallor. The gastro-intestinal tract negative; the chest negative, excepting for a faint systolic blow at the apex, which was not transmitted. The liver dullness began above the fifth interspace in the mamillary line, and extended two fingers' breadth below the ribs, where the edge could be felt distinctly indurated, sharp, and somewhat tender. The spleen was not palpable. There was rather marked pigmentation in the axillæ, perineum, scrotum, and along the vertebræ. There was no increased pigmentation of the face or of the hands, and the nipples were not pigmented. The skin showed an urticarial rash when irritated by scratching. There was hyperæsthesia, and pain from the waist downward. Temperature and touch sense appeared normal. Muscular sense normal; a slightly ataxic and spastic gait; the knee and plantar reflexes increased, and ankle clonus was present. Cremasteric reflex was diminished. The eye reflexes and eye grounds were normal; urine normal. Blood count showed 3,600,000 reds; 84 per cent. of hæmoglobin; 4,500 whites, and a few normoblasts and megaloblasts. The color index in this examination was 1.3. The nervous symptoms in this patient steadily progressed, and, when last heard from, he was almost helpless with a spastic paraplegia, and the evidences of pernicious anæmia still very marked.

Case 6. — Male; aged 62; merchant; resident of Wyoming; appeared February 28, 1902. He had typhoid fever during the war of the Rebellion. He went

to Wyoming twenty-five years ago because of asthma. In September, 1901, his appetite failed for meats, and it was noticed that he was pale. He visited West Baden, Indiana, and his general condition seemed to improve. He still complained of anorexia, and of general weakness. About January 1, 1902, he noticed constant numbness in the fingers and toes; at that time he had considerable eructation of gas, and his bowels became constipated. He had slight shortness of breath.

Examination showed an icteroid pallor; mucous membranes pale; lungs negative. Outline of heart dulness normal; a soft, systolic blowing murmur heard at the apex; no venous hum in the neck; no petechiæ of the skin or of the mucous membranes; the skin sensations subjectively normal. Knee jerks increased; slight ankle clonus; slight ataxia, and slight spasticity when walking. The eye grounds were normal. Liver palpable under the border of the ribs; abdomen flat; blood: red cells, 1,490,000; hæmoglobin, 47 per cent.; whites, 6,700. Differential count of whites: Polymorphonuclears, 69 per cent.; small mononuclears, 20 per cent.; large mononuclears, 9 per cent., and basophiles, 1 per cent. Both normoblasts and megaloblasts were found. The stomach contents, after a test meal, disclosed achylia gastrica.

The patient was placed in the Presbyterian Hospital, where many examinations of his blood and his stomach contents confirmed the findings of the first examination, and established definitely the diagnosis of pernicious anæmia. The urine showed nothing abnormal after repeated examinations. The nervous phenomena increased in severity. The patient complained daily of discomfort, of numbness, tingling, and usually of severe burning in the feet, and of numbness and tingling in both hands. The ataxia and spasticity increased; knee jerks and ankle clonus gradually increased, although during that time his blood condi-

tion improved over 50 per cent., and the patient finally felt so much better that he left for his home in Wyoming on May 13th. There can be no question that this case will relapse, and that the spinal cord phenomena and lesions will grow rapidly worse.

Case 7.—Female; aged 30; has borne two children; German by birth. Family history is entirely negative. The patient was robust, with rosy cheeks, when a girl, and was also well until after her first child was born, eight years ago. There was general œdema of the body eight months after the first childbirth, which lasted two or three months. Then, there was apparent recovery, and a second child was born six years ago. General weakness followed the second childbirth, so that the patient was hardly able to work. Her present trouble began about three years ago, when she felt very weak, and it was noticed that she was very pale. She had nausea and vomiting, with frequent attacks of diarrhœa, but without pain. The nausea and vomiting persist until the present time. Her friends noticed that her skin was not only pale, but slightly yellowish. One year ago the patient noticed that the finger-tips of both hands were numb. A girdle sensation appeared about the waist and lower abdomen six months ago. Numbness of the feet occurred about the same time. Gradually she became weaker, the lower extremities finally becoming so weak that she was unable to walk, and for nine weeks she has been confined to her bed. She has had some fever during the past six months, which has been irregular in its occurrence, lasting three or four days at a time. She says that three years ago her tongue and gums were sore; that the upper teeth rapidly decayed, and were finally all extracted. The lower teeth remained good.

She was admitted to the Presbyterian Hospital on April 30, 1902, complaining of great weakness. There was a sense of a girdle about the waist and abdomen, and a band-

like feeling about the calves of both legs. She had no appetite, and there were nausea and vomiting frequently after an attempt to take a meal or any liquid food. The bowels moved from three to five times a day; she was very pale; icteroid hue; mucous membrane of the mouth pale; lower teeth in good condition. She wore an upper plate, and the gums were healthy. The chest was negative, ex-excepting for a systolic bruit, which was heard loudest over the pulmonary area, but could be heard over the whole precordia. The abdomen was negative. The pelvis was negative. The patient was unable to stand because of weakness of the lower extremities. There was no alteration objectively of sensation; the knee jerks were greatly increased; ankle clonus was present. The patient had good control of the bowels and of the bladder. The eye reflex was normal to accommodation and light. The eye grounds were normal. Urine contained nothing abnormal, but was scant. On May 1st the blood showed 1,614,000 reds; 33 per cent. of hæmoglobin, and 5,600 whites. A differential count gave polymorphonuclears, 21.3 per cent.; myelocytes, 1.4 per cent.; small mononuclears, 74 per cent., and large mononuclears, 3 per cent., and eosinophiles, .3 of 1 per cent. A large number of normoblasts and megaloblasts were present. The stomach contents, after a meal, showed the absence of hydrochloric acid, and no bacteria in the smears.

This case, from the history, was clearly one of pernicious anæmia of more than one year's standing, which began with severe gastro-intestinal disturbance, while the nervous phenomena occurred much later, were progressive, and reached the stage of spastic paraparesis at the time of her admission to the hospital. During May the patient improved steadily in her general condition, with simple abundant food, iron and arsenic. The blood state at the last examination showed an improvement of 10 per cent. in

red cells, and 5 per cent. in hæmoglobin. Nausea and vomiting had ceased entirely, and the patient was able to stand with the aid of a chair and to take a few steps. The spastic condition of ataxia and paresis, while less, was still very marked. The patient is still under observation.

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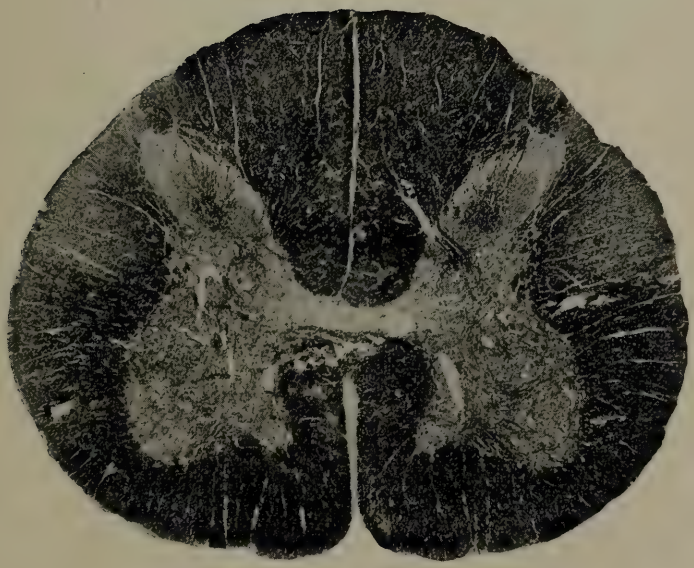
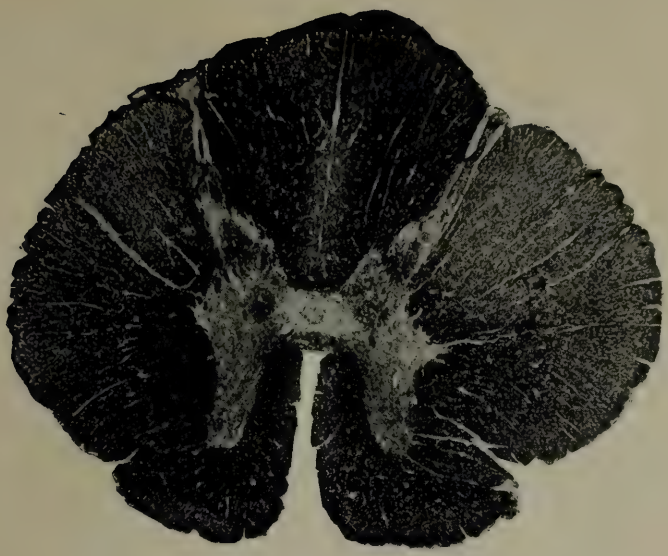
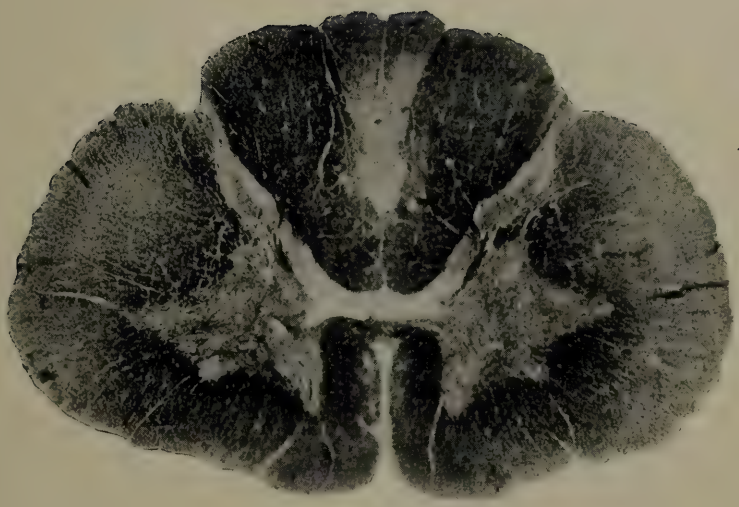
Case 1, Fig. 1.—(Weigert-Pal.)
Fourth Lumbar.
Degeneration of crossed pyramidal tracts.
Remainder of cord normal.



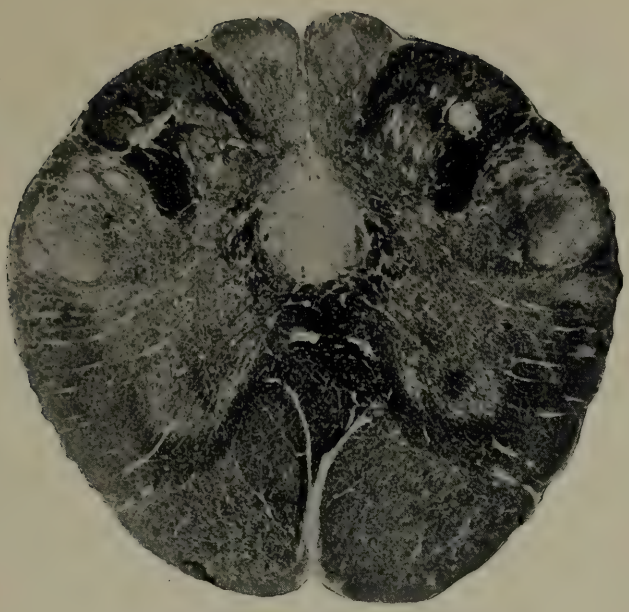
Case 1, Fig. 2.—(Weigert-Pal.)
Second lumbar.
Crossed pyramidal tracts degenerated.
Remainder of cord normal.



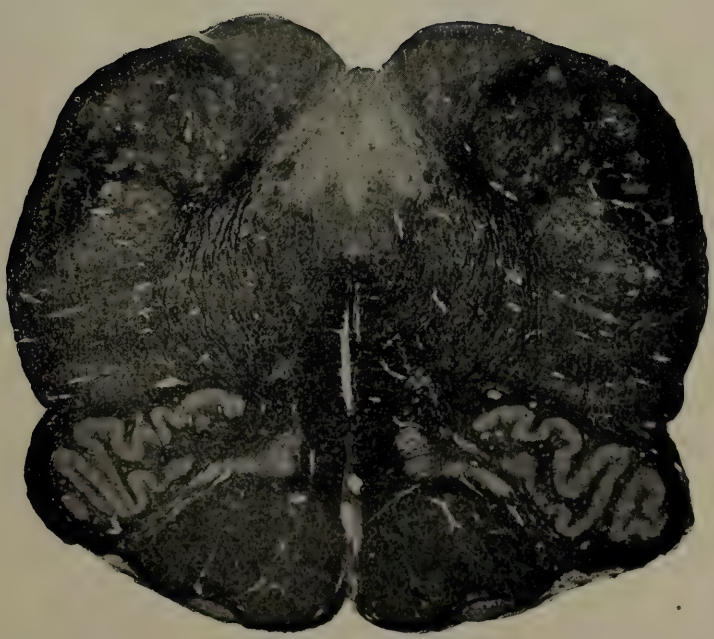
Case 1, Fig. 3.— (Weigert-Pal.)
Middle Thoracic.
Goll moderately degenerated.
Lateral tracts more extensively involved.



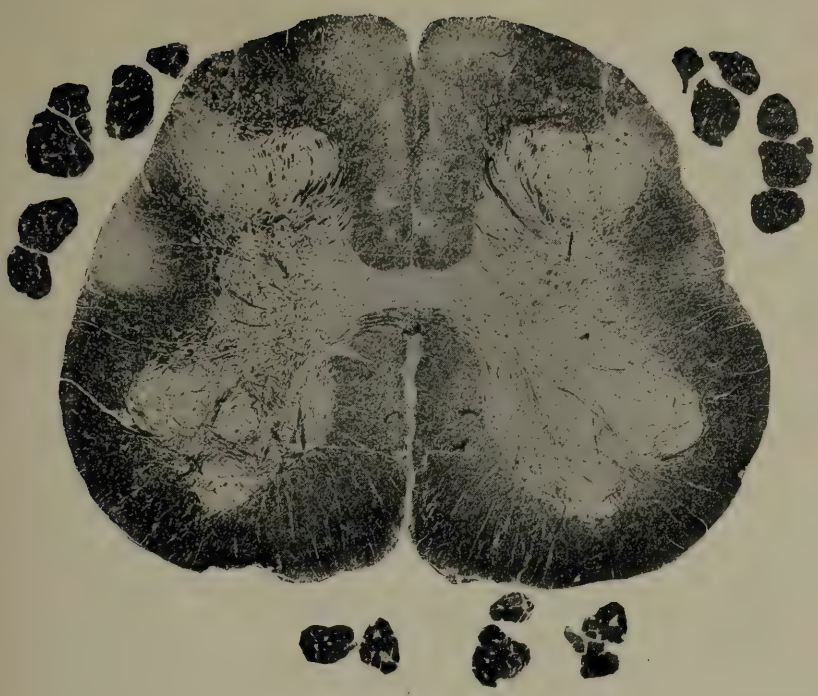
Case 1, Fig. 4.—(Weigert-Pal.)
About fifth cervical.
Column of Goll degenerated and sclerosed in middle. Burdach, slightly degenerated in proximity of sclerosis of Goll.
Lateral tracts extensively involved.
Remainder of cord normal.



Case 1, Fig. 5.—(Wigert-Pal) × 8.
Near junction of cord and medulla.
Columns of Goll extensively degenerated, otherwise the section is normal.

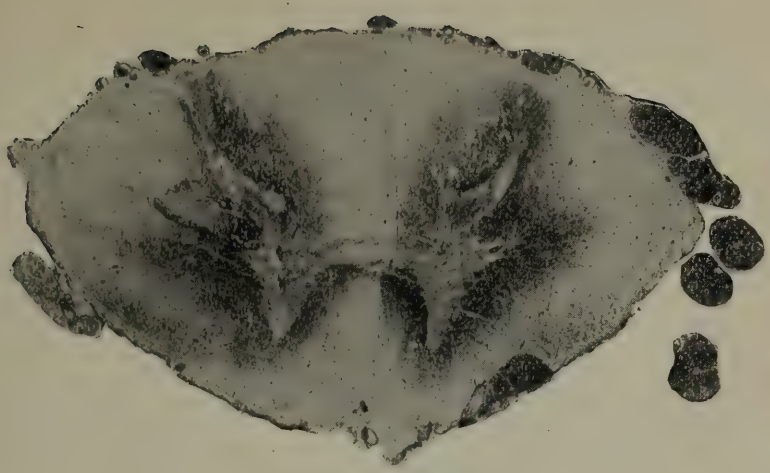


Case 1, Fig. 6.—Medulla, normal.—(Weigert-Pal.)



Case 2, Fig. 1.—(Weigert-Pal.)
Fourth lumbar.
Post. column degenerated. Oval bundle of Fleschsig normal.
Lateral tracts unequally degenerated.
Remainder of cord and nerve roots normal.

Case 2, Fig. 2.—(Weigert-Pal.)
About level of twelfth thoracic.
Post. degeneration more extensive and sclerosed.
Lateral more extensively and almost equally degenerated.
One direct pyramidal tract extensively degenerated.

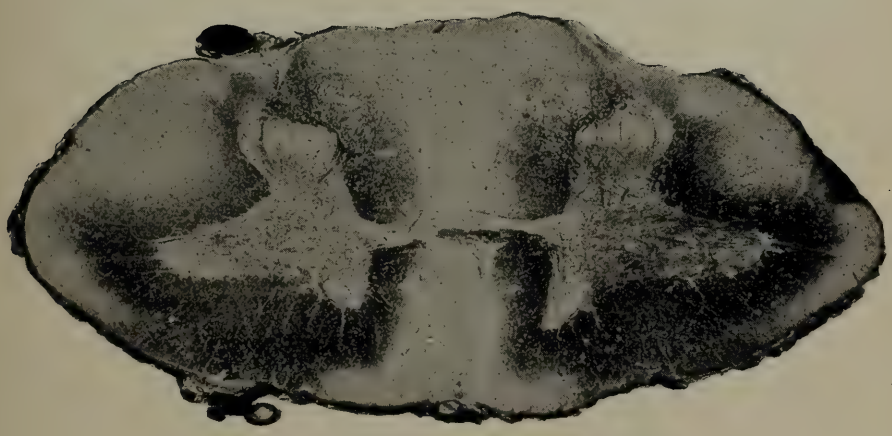


Case 2, Fig. 3.—(Weigert-Pal.)

Mid. Thoracic level.

Degeneration very extensive—involving the whole periphery of the cord.

The gray matter of cord, the post. root zone and Lissauer practically normal.

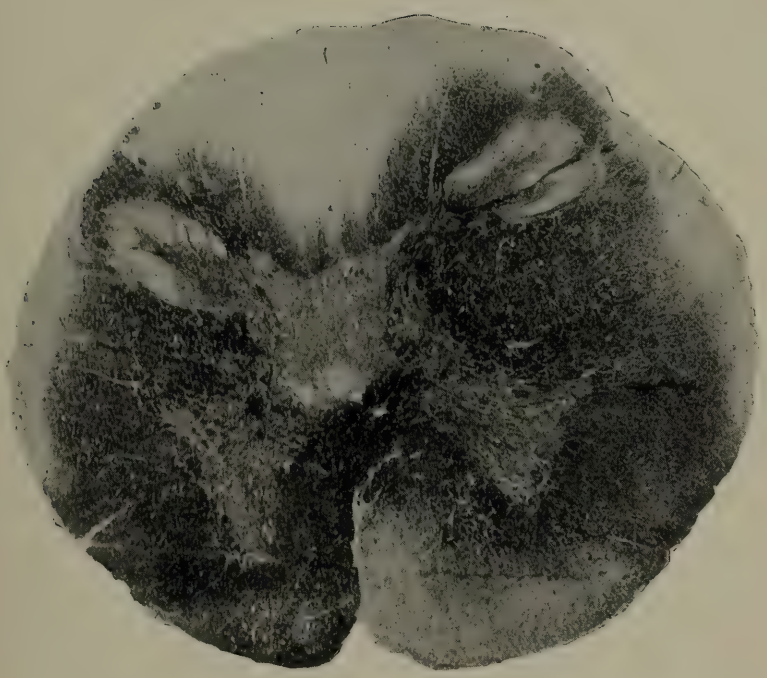


Case 2, Fig. 4.—(Weigert-Pal.)

Level of eighth cervical.

Posterior columns, and the pyramidal, direct cerebellar and Gower's tracts in the lateral columns and the direct pyramidal tracts extensively degenerated and sclerosed.

The gray matter, Clark's nucleus, Lissauer and the root zone free.



Case 2, Fig. 5.—(Weigert-Pal.)

Level of junction of cord and medulla.

Column of Goll entirely degenerated, except at gray commissure.

The medial and posterior parts of the columns of Burdach are completely degenerated, leaving the lateral portion normal.

Both direct cerebellar tracts are degenerated.

One pyramid is much degenerated; the other very slightly changed.

The spinal tract of the trigeminus is unaltered.

Case 2, Fig. 6.—(Weigert-Pal.)

Level of inferior medulla.

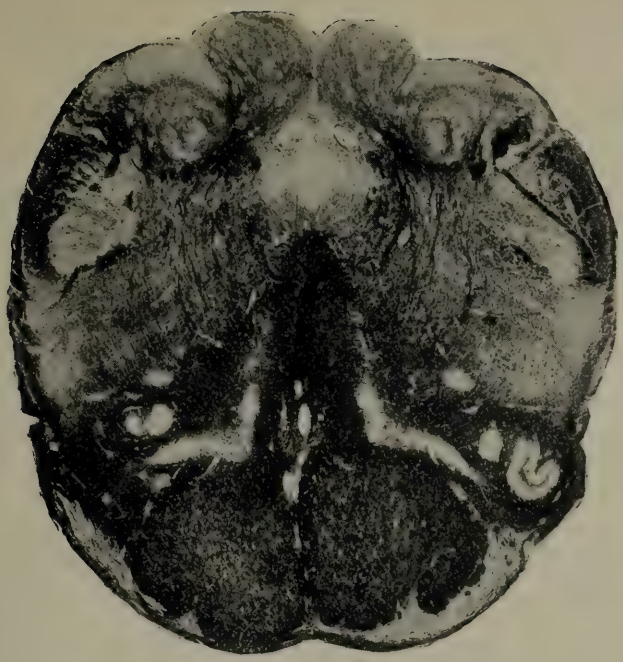
The upper extremity of column of Goll is completely degenerated.

The column of Burdach, excepting a small area between the nucleus of Burdach and the posterior horn, is degenerated.

The direct cerebellar tracts are degenerated.

One pyramid is much, the other only very slightly altered.

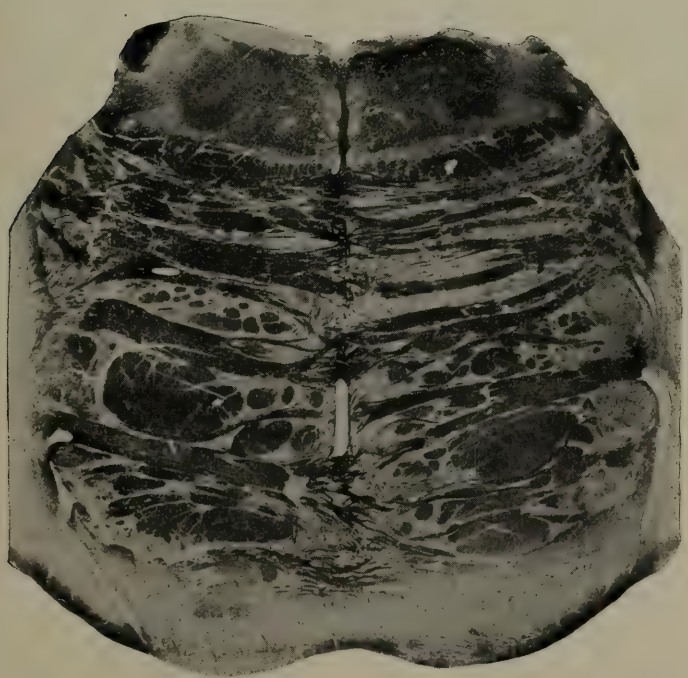
Other portions of section, normal.



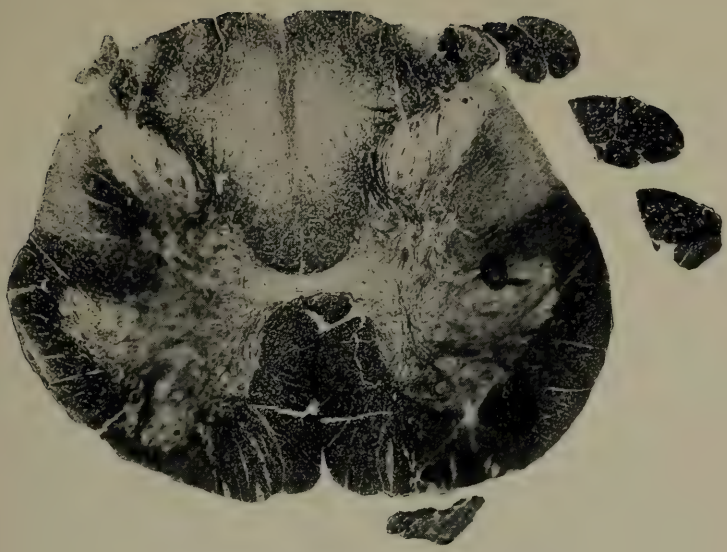
CASE 2, FIG. 7.—(Weigert-Pal.)
The lower medulla.
Moderate diffuse degeneration of pyramids.
Columns of Burdach degenerated.
Direct cerebellar tracts degenerated.

CASE 2, FIG. 8.—(Weigert-Pal.)
The mid. medulla normal except for very slight degeneration of the pyramids.

Case 2, Fig. 9.—(Weigert-Pal.)
Section of lower pons.
Extensive and intense degeneration of both pyramids—
one more than the other.
Otherwise normal tissue.

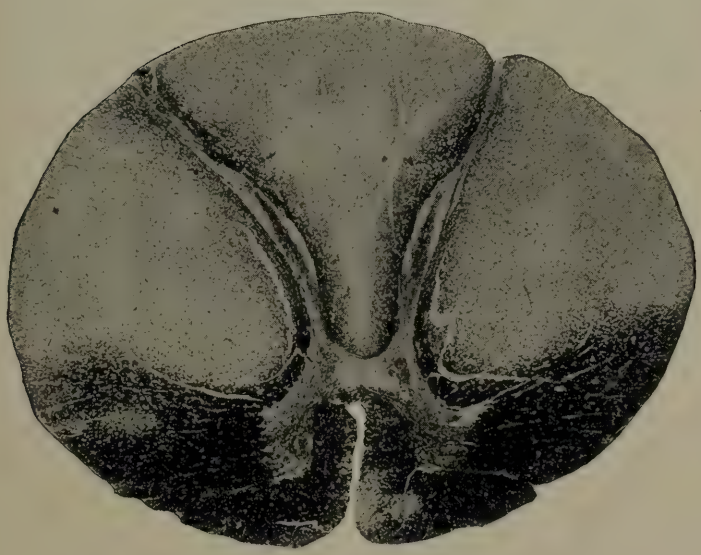


Case 2, Fig. 10.—(Weigert-Pal.)
Section of upper pons, normal.
The ventrally located white border may be an artefact.



Case 3, Fig. 1.—Weigert-Pal.)

Section at level of first lumbar.
Degeneration of Burdach in middle zone chiefly.
Root zone and Lissauer free.
Crossed pyramidal tracts degenerated.
Spinal gray, remainder of white, cord and spinal roots normal.



Case 3, Fig. 2.—(Weigert-Pal.)

Level of second thoracic.

Extensive degeneration of columns of Goll and Burdach, excepting the border of white at gray commissure and post. horns.

The lateral tracts invaded extensively.

The direct pyramidal tracts unequally degenerated in a small area.

The gray matter, the root zone, Lissauer and nucleus of Clark remain practically free.

Case 3, Fig. 3.—(Weigert-Pal.)

Level of fourth cervical.

Extensive degeneration with marked sclerosis of Goll. Extensive, but less sclerotic degeneration of Burdach. A narrow band of almost normal white tissue persists at the gray commissure and bordering the post. horns.

The root zone and Lissauer are practically free.

Extensive degeneration of the lateral tracts, old and recent, as indicated by the dense whiteness and the cribriform appearance, respectively.

Slight degeneration in one direct pyramidal tract.

The gray matter, cells in ant. horns, Clark's nucleus, normal.

ARTICLE III.

DEMONSTRATION OF A MODEL OF THE THORACIC AND ABDOMINAL VISCERA PREPARED FROM A HUMAN SUBJECT HARDENED IN FORMALIN.

By JOHN WARREN, M.D.
OF BOSTON.

JUNE 11, 1902.

DEMONSTRATION OF A MODEL OF THE THORACIC AND ABDOMINAL VISCERA PREPARED FROM A HUMAN SUBJECT HARDENED IN FORMALIN.

THIS model was made during the winter of 1902 in the Anatomical Department of the Harvard Medical School. A few years ago, a model of the abdominal viscera was made under the direction of Professor Dwight by this same method. This model was enlarged three times on a linear scale, and was intended for use in the lecture room; later four smaller models of actual life size were made for section teaching. These models were so successful that we attempted this time to make a model of the entire trunk with the thoracic and abdominal visera in situ.

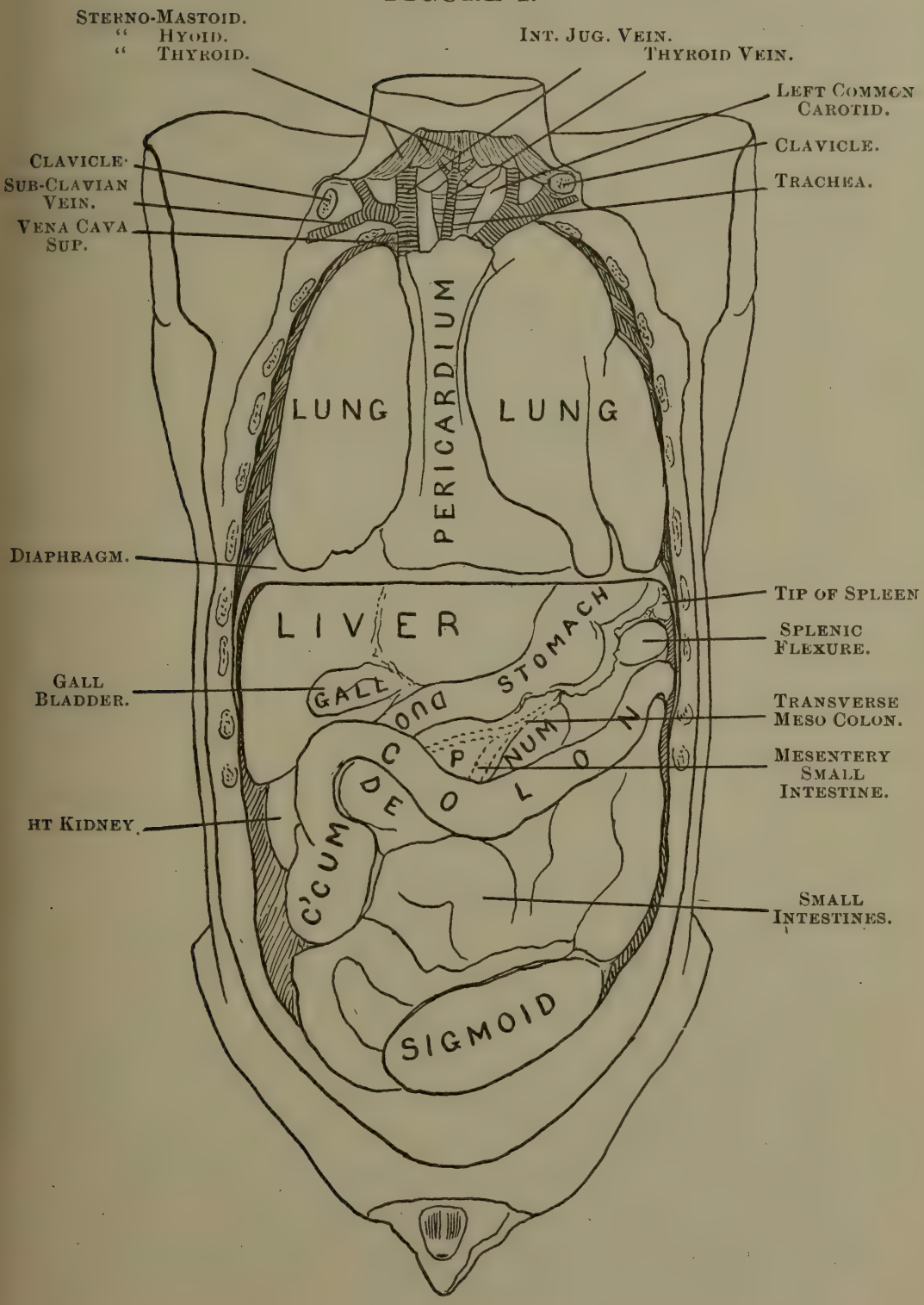
The method of preparation was as follows. The best subject then on hand was selected. It was an adult male about 65 years of age, muscular and apparently well nourished. The body was hardened by successive injections of formalin, which was allowed to move very gradually into the right femoral artery; about four and one-half quarts were used in four strengths of 10, 25, 35, and 50 per cent. respectively. This method of hardening subjects by formalin is a well-known one, and has been used extensively by Prof. Cunningham of Dublin and Prof. His of Leipzig. It was also used by Prof. Dwight to prepare the models made here previously. It is the best method of obtaining the exact shape and position of the various organs, and their relations to each other, and is especially useful in the study

of variations in the size and shape of the abdominal organs.

The subject was allowed to harden about three weeks and then the larger vessels were filled with the usual wax mass. The entire anterior wall of the trunk was thus removed and a cast in plaster taken of all the viscera in situ. The lungs were removed, a cast of these organs made, and then a cast of the pleural cavities with the pericardium in place. Next the pericardium was removed, the great vessels in the superior mediastinum dissected out, and a cast of these structures made. The heart and structures in the posterior mediastium were then treated in the same manner. The diaphragm was then cut at the sides and laid back to enable us to make a cast of the upper surface of stomach, spleen and liver. The various abdominal organs were then removed in succession, and treated in the same manner as the thoraic viscera. From these casts the organs were modeled in blotting paper with the exception of the spleen and kidneys, which were made in plaster. These paper models are much better than plaster ones, as they are very light and durable, and especially useful in a model which is to be handled to any extent. Plaster models are unwieldy and tend to chip and break. The casts and modelling were done by Mr. J. H. Emerton of Boston, who made the other models here, and this success has been largely due to his skill.

Fig. I shows the whole model with all the viscera in place. The lungs were very difficult to model, as they did not harden well, and the right lung was much contracted, and its fissures entirely obliterated by old inflammatory adhesions. A portion of the posterior lobes behind had to be removed in order to enable us to remove and replace the models easily. Therefore we have contented ourselves with a rough model only of these organs, chiefly to show their relations in front to the pericardium. The anterior edge of the diaphragm has been cut away for about two

FIGURE I.

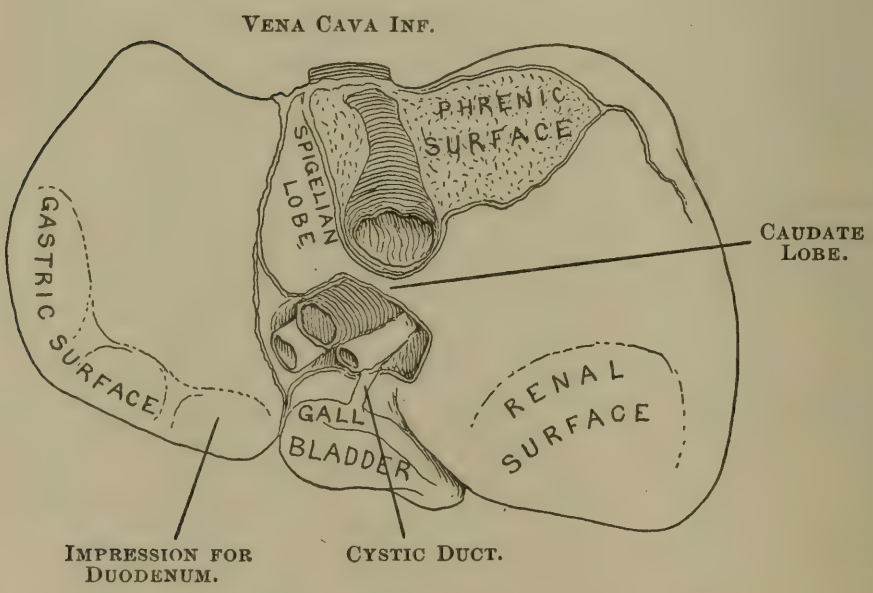

STERNO-MASTOID.
" HYOID.
" THYROID.
INT. JUG. VEIN.
THYROID VEIN.
LEFT COMMON CAROTID.
CLAVICLE.
TRACHEA.
CLAVICLE.
SUB-CLAVIAN VEIN.
VENA CAVA SUP.
PERICARDIUM
LUNG
LUNG
DIAPHRAGM.
TIP OF SPLEEN
LIVER
STOMACH
SPLENIC FLEXURE.
GALL BLADDER.
GALL
DUO
TRANSVERSE MESO COLON.
C P NUM
MESENTERY SMALL INTESTINE.
DE
O L O N
HT KIDNEY.
C'CUM
SMALL INTESTINES.
SIGMOID

inches, in order to expose the liver and stomach more completely and to enable us to remove these organs with ease.

The left lobe of the liver projects about three inches to the left of the median line; this is the usual limit of this lobe, though it may not uncommonly extend entirely across to the left abdominal wall. The gall bladder is distinctly large, though no gall stones were present. Fig. II shows

FIGURE II.

LIVER FROM BEHIND.



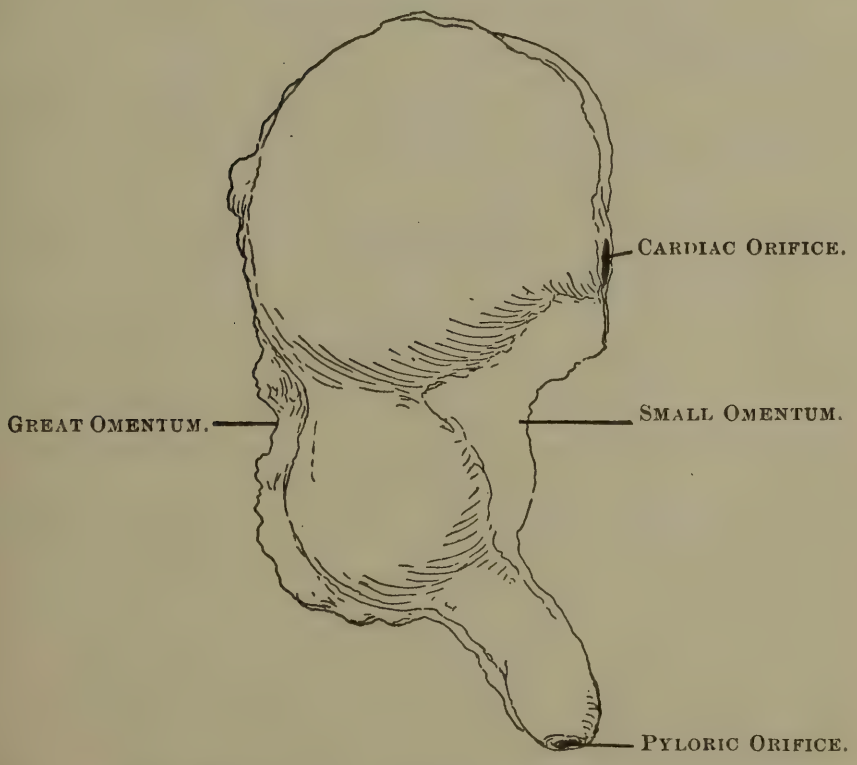
the liver from behind. The double lines represent the reflections of the peritoneum; the dotted area corresponds to the non-peritoneal area that is attached to the diaphragm. On the under surface of the left lobe is seen an impression for the stomach and also for the duodenum. This latter organ has been displaced somewhat to the left owing to the small and contracted stomach. The renal impression on the right lobe is placed much lower down and farther forward than usual; this is due, I think, to the low position of the right kidney (Fig. VI). Therefore there is quite a large surface on the back of the right lobe covered by peri

toneum, between this renal impression and the non-peritoneal area, where the renal impression should be, if the kidney was in its normal position.

The stomach is distinctly small, and in the model it has been slightly distended for convenience in making the cast. A distinct contraction is seen at about the middle of the greater curvature; this is much more distinct on the pos-

FIGURE III.

STOMACH FROM BEHIND.

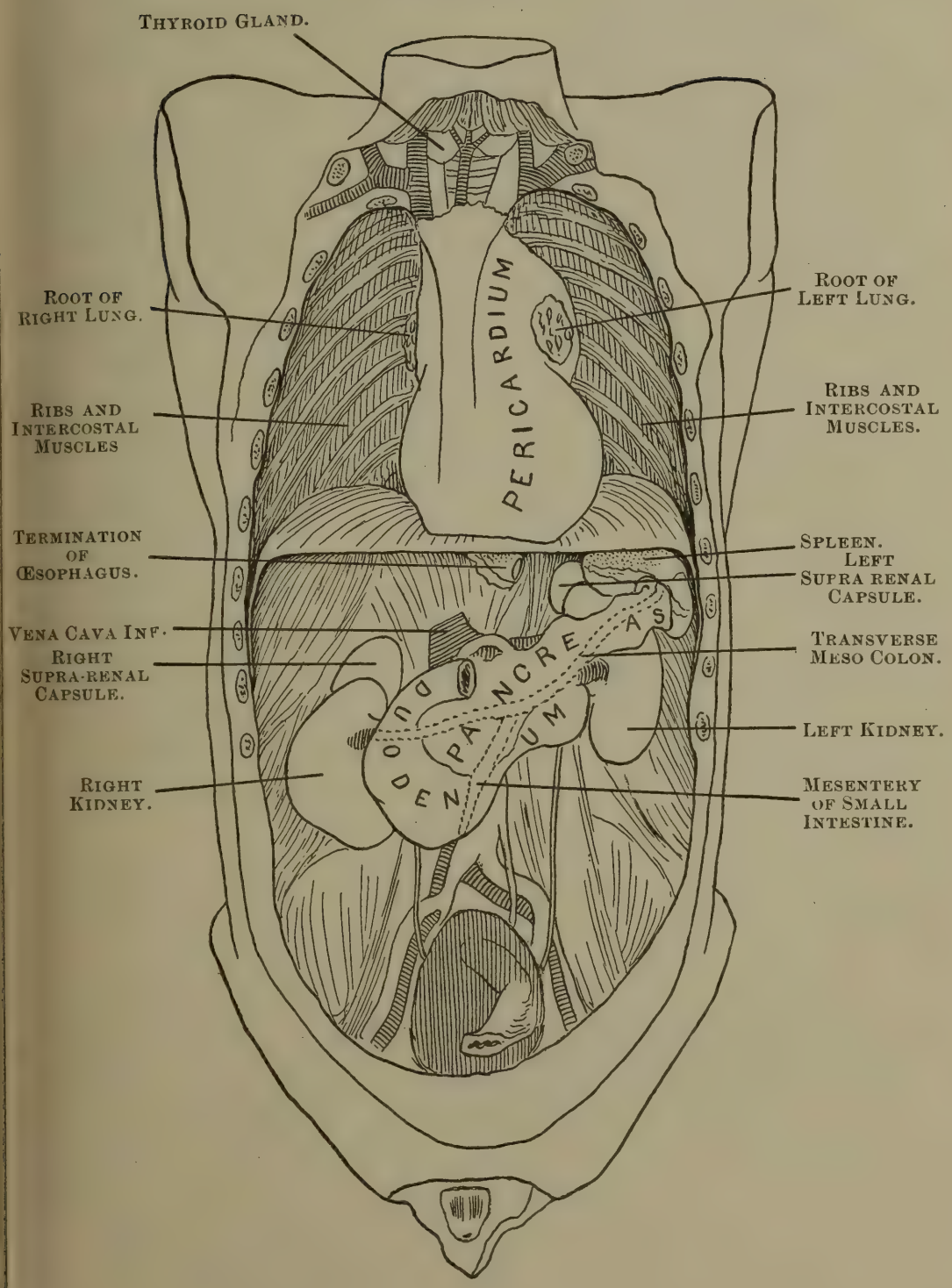


terior surface (Fig. III), and is probably an hour-glass contraction. Just below this, and about two inches from the pyloric orifice, is seen another contraction. This part of the stomach, known as the antrum pylori, is quite variable and may be double or even triple. Its tubular form is in this case quite striking. The pyloric orifice in this case lies in the median line, or if anything a bit to the left.

Usually this part of the stomach is more or less to the right of the median line, depending on the distention of the organ. The first portion of the duodenum is placed farther to the left than usual, and a distinct impression is seen for it on the wider surface of the left lobe of the liver (Fig. II). This part also runs almost directly to the right with but little of its usual backward direction. The first part of the duodenum and the pyloric end of the stomach are very movable, and their position is easily affected by the degree of distention or size of the stomach. The small size of that organ accounts, I think, for the position of the duodenum and pylorus in this case.

The cæcum is very small and very tightly contracted. The space seen between it and the abdominal wall is due to the fact that there was a large collection of fat here, which had to be removed in order to take the cast. No appendix could be found, though a most careful search was made. It is possible to have this organ absent, as was the case in a subject I saw this year in the dissecting room; but it is only fair to say that it may have been lost in the removal of the fat, which becomes very hard when treated with formalin, in spite of all care to the contrary. The ascending colon is short and is also very contracted, as is also the case with the transverse and descending colons. The latter is concealed by coils of small intestine, but the beginning of the sigmoid is quite dilated. (Fig. I.) The various coils of the small intestine have been represented in a rough model, as it was practically impossible to make an exact model that would fit. I do not expect, however, that they will be used in practical work with the model, and simply had them made to complete the abdominal contents. A part of the second portion of the duodenum is seen just below the hepatic flexure and the termination just above the transverse colon farther to the left. A portion of the pancreas (Fig. I. P) is seen within the curve of the duodenum; the dotted lines repre-

FIGURE IV.


THYROID GLAND.
ROOT OF RIGHT LUNG.
RIBS AND INTERCOSTAL MUSCLES
TERMINATION OF ŒSOPHAGUS.
VENA CAVA INF.
RIGHT SUPRA-RENAL CAPSULE.
RIGHT KIDNEY.
PERICARDIUM
ROOT OF LEFT LUNG.
RIBS AND INTERCOSTAL MUSCLES.
SPLEEN.
LEFT SUPRA RENAL CAPSULE.
TRANSVERSE MESO COLON.
LEFT KIDNEY.
MESENTERY OF SMALL INTESTINE.
DUODENUM
PANCREAS

sent the attachments of the transverse mesocolon and mesentery of the small intestine. The tip of the spleen and the splenic flexure of the colon are seen on the left just below the greater curvature of the stomach.

In Fig. IV. the lungs, stomach, liver and intestines below the duodenum have been removed. The pericardium is seen in situ, the lines on its anterior surface representing the limits of the two pleural sacks. The pleura has not been represented and the ribs and intercostal muscles are seen in the two pleural cavities. The roots of the lungs are shown in section on either side of the pericardium. In the abdominal cavity the duodenum and pancreas are seen. The former is shown in its whole length, the second portion overlapping the right kidney and being crossed by the line of attachment of the transverse mesocolon, which extends along the body of the pancreas to the spleen. The third portion is crossed by the line of attachment of the mesentery of the small intestines. There is practically no fourth portion in this case, and though the duodenum with four portions is as a rule the more usual, still one with only three is not at all uncommon. The pancreas is well developed in this case and its tail is in close apposition with the spleen, there being a well marked

FIGURE V.

PANCREAS AND DUODENUM FROM BEHIND.

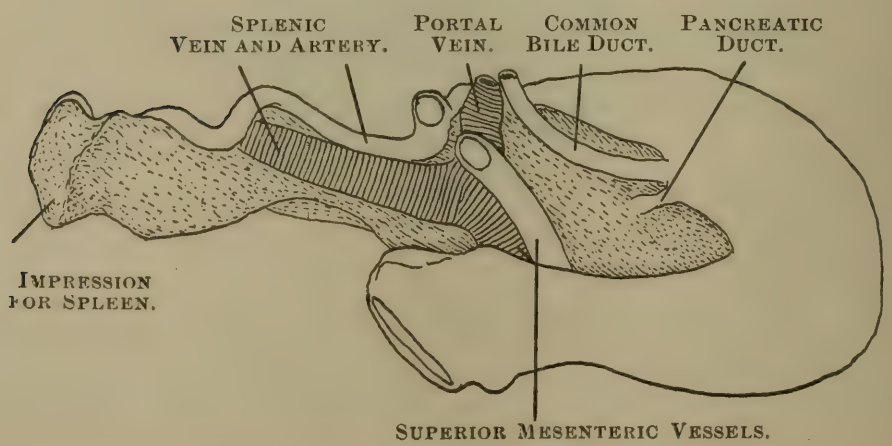
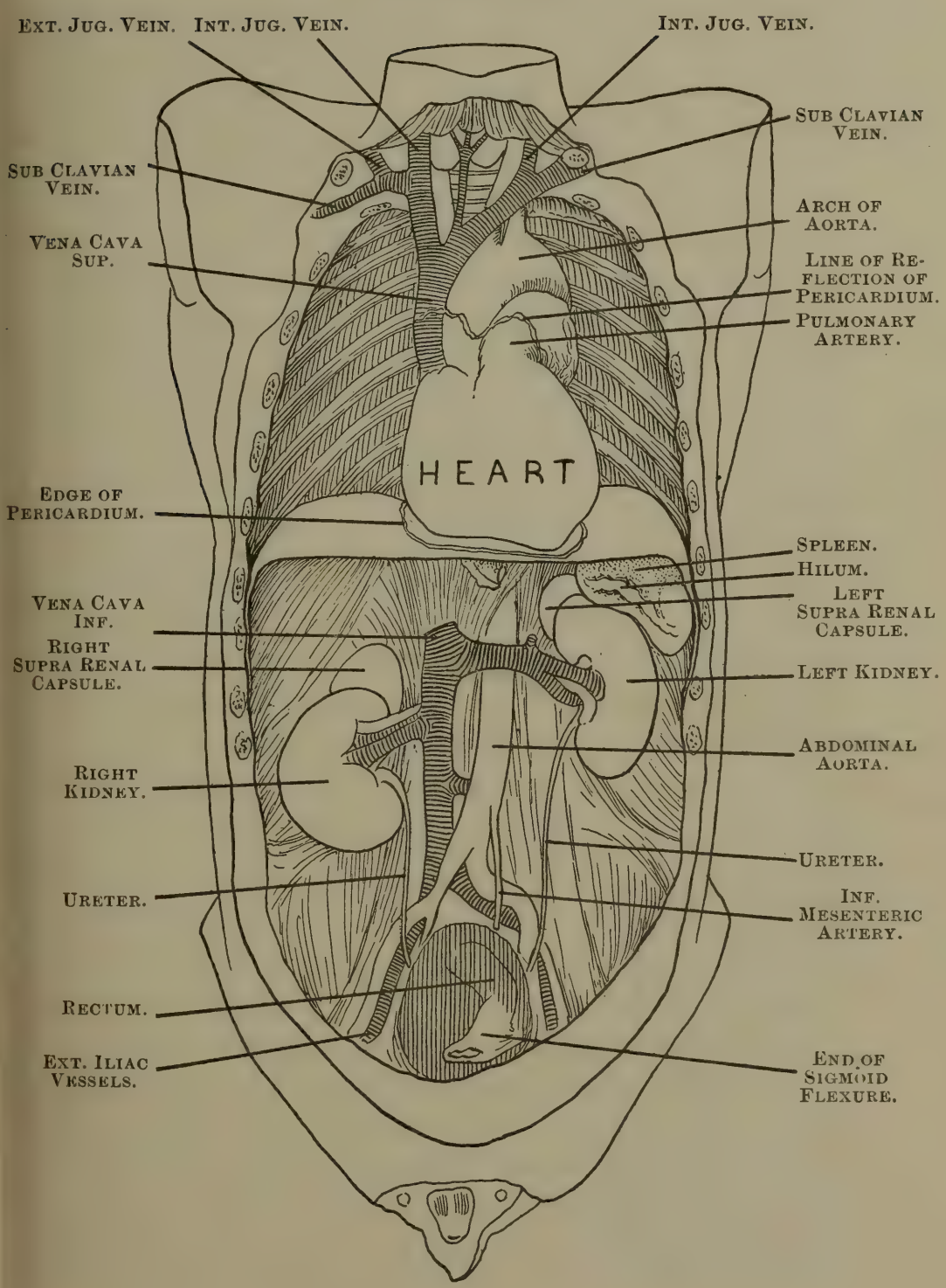


FIGURE VI.


EXT. JUG. VEIN.
INT. JUG. VEIN.
INT. JUG. VEIN.
SUB CLAVIAN VEIN.
SUB CLAVIAN VEIN.
ARCH OF AORTA.
VENA CAVA SUP.
LINE OF REFLECTION OF PERICARDIUM.
PULMONARY ARTERY.
HEART
EDGE OF PERICARDIUM.
SPLEEN.
HILUM.
LEFT SUPRA RENAL CAPSULE.
VENA CAVA INF.
RIGHT SUPRA RENAL CAPSULE.
LEFT KIDNEY.
ABDOMINAL AORTA.
RIGHT KIDNEY.
URETER.
URETER.
INF. MESENTERIC ARTERY.
RECTUM.
EXT. ILIAC VESSELS.
END OF SIGMOID FLEXURE.

impression there for that organ. Fig. V. shows the pancreas and duodenum from behind, these two organs being modeled in one piece. Along the upper border are seen the splenic vessels; passing down behind the body, but in front of the third part of the duodenum are the superior mesenteric vessels. The portal vein and common bile duct, with the pancreatic duct joining it at the second portion of the duodenum, are seen behind the head of the pancreas.

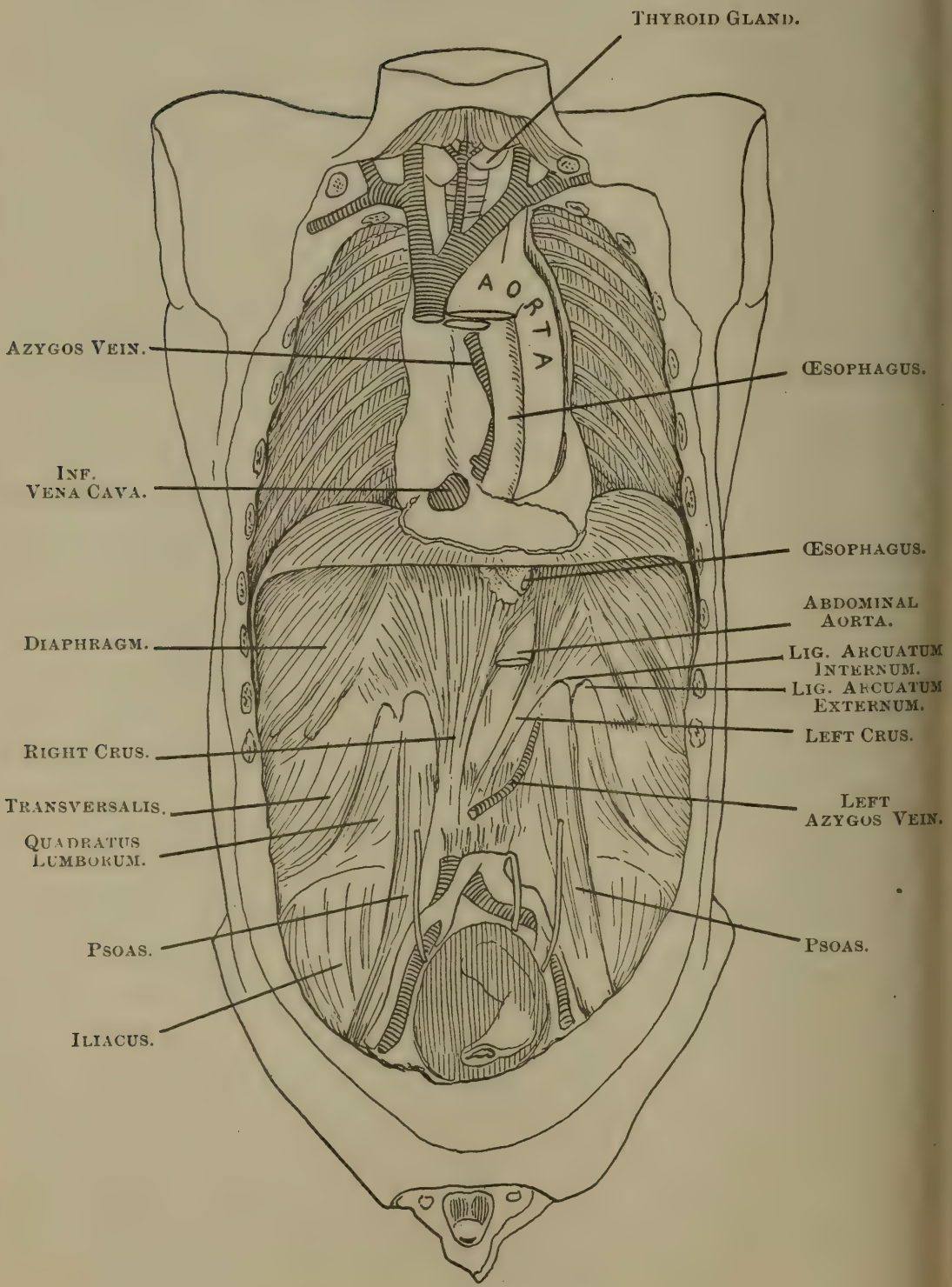
In Fig. VI. the heart and great vessels are exposed. The heart is large and the arch of the aorta rather dilated; this condition is probably due, partly to the age of the subject, and partly to some overdistention from the wax mass. For this latter reason, the beginning of the pulmonary artery does not lie so directly in front of the beginning of the aorta as usual. Across these vessels and the superior vena cava is seen the line of reflection of the pericardium. In front of the trachea is a large vein passing from the thyroid gland to the left innominate vein. Above the gland are the cut ends of the sterno hyoid, sterno thyroid and sterno mastoid muscles. In the abdomen, the duodenum and pancreas have been removed. The left kidney is in its usual position, but the right is displaced downwards and overhangs the brim of the pelvis. This is not due to pathological causes, I think, but is rather of congenital origin, as the right renal vein is given off two inches below the left. The suprarenal capsules are the only artificial part of this model. In the subject they were so very small, of such unusual shape, and the right one separated so far from its kidney, that it was impossible to reproduce them. Those for the suprarenal bodies of another subject were hardened and models made from them, in order to have all the abdominal organs represented. There is a distinct separation between the aorta and superior vena cava. The former bends to the left, and the iliac vessels, especially the left common iliac, are quite tortuous, as if the whole aorta was rather too long for the trunk. There were no

spinal curvatures present, however, to account for this condition, though perhaps over-distention by the wax mass may have had something to do with it.

In Fig. VII. the structures in the posterior mediastinum are shown. The aorta seems large, especially at the arch, and lies somewhat more to the left of the œsophagus than usual, probably for the reason just mentioned. In the abdomen, there is an admirable view of the muscles of the posterior adominal wall, the outlines of which were very distinct in the hardened subject. The diaphragm is shown with the two crura surrounding the beginning of the abdominal aorta, and the two arched ligaments, the ligamentum arcuatum internum and externum, arching over the psoas and quadratus lumborum. To the outer side of the quadratus lies the transversalis, and below this muscle the iliacus. To the left of the left crus is seen a left azygos vein passing from the inferior vena cava (Fig. VI.) to the left lumbar veins. In the pelvis the peritoneum has been left in place and the termination of the sigmoid flexure and the beginning of the rectum are seen. The external genitals were removed at the pubes, and the corpus spongiosum with the urethra, the corpora cavernosa, and the spermatic cords are seen in section. The trunk was made in paper, just as the various viscera were made, but some plaster has been placed along the spinal column to strengthen it and act as ballast. The whole model is quite light and easy to handle, and weighs with all the viscera in place fourteen and one half pounds.

These models have been found very useful in section teaching, as in the dissecting room the student often fails to get an exact idea of the shape and relations of the various organs, as they are usually soft, and impressions made on them by neighboring viscera are generally absent. There are several details about this model which are unusual or even abnormal,—the shape of the stomach especially, the position of the duodenum and right kidney, the size of the cæcum

FIGURE VII.


Thyroid Gland.
Aorta.
Azygos Vein.
Œsophagus.
Inf. Vena Cava.
Œsophagus.
Abdominal Aorta.
Diaphragm.
Lig. Arcuatum Internum.
Lig. Arcuatum Externum.
Left Crus.
Right Crus.
Transversalis.
Left Azygos Vein.
Quadratus Lumborum.
Psoas.
Psoas.
Iliacus.

and colon. To be of any value, however, such a model must represent the exact anatomical conditions found in a given subject, and no attempt should be made to improve on nature. That is what has been done here with great care, with the exception of the supra-renal capsules, and I rather doubt the wisdom of what was done in that case. It is only by this careful representation that any correct idea can be obtained of the variations in the shape and relations of organs, and from a study of models prepared in this manner it may be found that there are wider variations within normal limits than one would suppose. Even if the conditions found here are not perfect from an anatomical point of view, they are certainly interesting for clinical study.

ARTICLE IV.

EMPYEMA IN CHILDREN.

By FREDERICK J. COTTON, M.D.
OF BOSTON.

READ JUNE 11, 1902.

EMPYEMA IN CHILDREN.

THIS paper is based on a series of cases of empyema in children; its deductions apply to children only.

Through the courtesy of Dr. Bradford, Dr. Burrell and others of the Children's Hospital staff, the writer has had an exceptional opportunity for the study of the treatment of empyema in children. The work was begun with the idea of studying the somewhat neglected "siphon" or negative pressure treatment. To this end special apparatus was devised; first, a hydrostatic apparatus in which the negative pressure exerted could be accurately estimated and regulated by means of a water-column, the chest cavity being connected by an air-tight joint with the air reservoir of the apparatus; and secondly, a form of valve dressing (of sheet gutta-percha) was contrived which rendered better service mechanically than the valves previously described by various writers.

This treatment by negative pressure, carried out on a number of patients, proved of definite value in the more chronic cases, where failure to heal was really due to non-expansion of the lung; these results will be reported elsewhere. In the acute cases the results were not especially brilliant, though better rather than worse than the average.

In the course of this work the writer became interested in studying the general course of the disease, its treatment and results, and it is from this point of view that this paper

has been written. This study has been greatly helped by the permission of Dr. Bradford and Dr. Burrell to make use of the Children's Hospital records since 1885. Many of these older cases were sent out for, and twenty-nine reported in person or by letter. A series of cases published in the Children's Hospital Reports, by Dr. Burrell, and an unpublished series by Dr. Goldthwait, kindly placed at the writer's disposal, gave data as to end-results in a number of other cases of this series. Four cases at the Infants' Hospital are also reckoned in, cases treated by the writer through the courtesy of the staff. The total is 180 cases — of these 45 were under the writer's care for a part or all of their course (21 of them for both operation and treatment) — in 86 the end results have been verified; there are in all satisfactory data in 146 cases, recent cases and those with defective records being omitted.

The data have been considered statistically, but the varying character of the cases renders statistics satisfactory only in the broader sense, and part of the conclusions reached are frankly deductions from a study of the cases in detail, which study cannot be reproduced here.

Age.—All cases were under 12 years — the youngest seven months. 51% were under five years. The average age was 4.9 years.

Etiology.—Of cases where data are given, 104 followed pneumonia, 9 followed a probable pneumonia; only 4 were definitely primary. In some few cases the pneumonia was secondary to exanthematous or other disease. So far as the records show, the pneumonia seems in all cases to have been of the lobar type.

Tuberculosis seems in this community to play a very slight rôle in causation of empyema in children. In the whole list there was no case of tuberculous empyema proved as such. Tuberculosis of the lung was proved by autopsy in one case, diagnosed clinically in five others, but in no case with demonstration of bacilli.

Cultures are recorded in 48 cases, 33 of which showed pure pneumococcus, 7 pure streptococcus, 1 (a double empyema) streptococcus on one side, pneumococcus on the other, 1 mixed pneumococci and staphylococci; 1 pneumococcus and various saprophytes, 2 pure staphylococcus, 1 saprophytes only, and 2 cultures were sterile.

This preponderance of pneumococcus infection, different though it is from the conditions in adults, is in conformity with other statistics for children published by Netter and others.

Date.—As to the date of occurrence there is a wide variation in the interval between the pneumonia and the empyema — from an imperceptible interval to many months. One case occurred a year after pneumonia, several at three to six months. The average interval is not quite seven weeks; the mean is about five weeks.

Physical Signs.—As to the physical signs little need be said. Even after short duration, large effusions are usually found. Encapsulated or sacculated effusions are the exception; only six are noted as such in the records. The usual type is that of a "total" empyema, flat to percussion from the third rib in front, from the scapular spine behind, with the heart considerably displaced.

The amount of effusion tolerated by children without cyanosis, dyspnœa, or obvious discomfort is relatively much more than is usual with adults.

Double empyema is recorded in but two cases; in both the second effusion was small, and was not operated on; both were autopsy cases.

Fifteen cases came in as empyema necessitatis or with a fistula from spontaneous opening. The point of rupture was posterior or axillary in four, in the classical position (2d to 5th space in front) in eight, unrecorded in two.

Spontaneous opening through the scar was not unusual in the recurrent cases.

Operation.—All cases were tapped as a preliminary. In some cases operation was deferred until it was evident that the effusion was not absorbing, and then performed.

In seven cases the effusion, usually small, subsided after tapping and no further operation was done.

In two cases operation showed little or no pus and drainage was not used or needed. In two cases where pus was present the attempt was made to let them close without drainage; these had to be drained later.

The operations done were—incision in the 7th or 8th space in the axilla, or subperiosteal resection of the 7th, 8th or 9th rib, about one inch of the rib being removed in the mid. or posterior axillary line. The choice of incision or excision was largely personal, save where in desperate cases incision gave the simpler operation. In either case, except as noted, tube drainage was used. All operations were under ether, or chloroform.

The writer prefers and has consistently used the excision operation, mainly because it gives room for digital exploration and for the shelling off and delivering of the massive fibrin clots which usually line the pleura. These, if left, disintegrate and about the 4th to the 10th day greatly interfere with proper drainage.

In two cases an opening was made into a presenting abscess and a counter opening made elsewhere for better drainage; in two other cases two openings were deliberately made. The cases showed no advantage in this procedure.

In no case was a double operation done for double empyema.

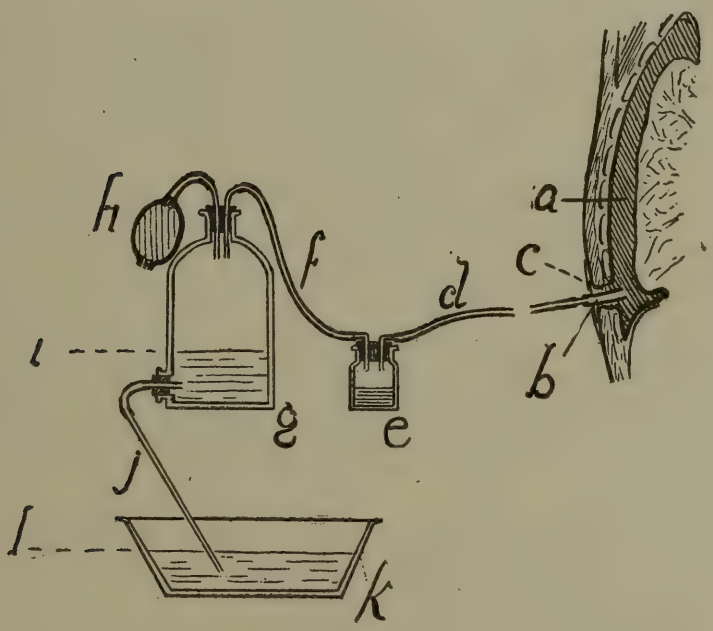
In two late chronic cases Estlander's operation was done. One died at two and a half, one at four weeks after this secondary operation.

Delorme's operation — decortication so-called — was not tried.

As to operative complications, temporary collapse is frequently recorded.

Hemorrhage on the table occurred in several cases, not from the intercostal artery but from the pleural surfaces; it always yielded to hot irrigagtion.

This complication seems to the writer the only occasion for irrigation at the time of operation. Irrigation *per se* is probably dangerous and hardly useful. It was however, practised in about half of the cases in our series, though relatively seldom since 1898, before which time it was the usual routine.



SUCTION-APPARATUS FOR EMPYEMA.

(a)—Chest cavity. (b)—Tube in opening. (c)—Gutta-percha sheet gummed down to make air-tight joint. (d)—Tube connecting chest-cavity with (e) Catch-bottle to receive discharge; connected by tube (f) with (g)—Reservoir bottle. (h)—Exhaust syringe. (j)—Tube connecting bottle (g) with water in the pan (k). The negative pressure is measured and maintained by the water-column the height of which is the difference of the levels of water at (i) and (l). The level (i) in the bottle (g) may be increased as desired through the pump (h).

AFTER-TREATMENT.—In a large proportion of cases, the simple drainage tube (with antiseptic dressings) was used.

Irrigation after the operation was more or less regularly used in 69 cases. Chlorinated soda and boric acid, weak

corrosive, salt solution, water, and in one case enzymol, were used. In a few cases irrigation by immersion (dependent upon respiration for the washing) was used. Of late years irrigation has been largely abandoned except in very foul cases.

The Cabot valve was used in many of the earlier cases. A similar valve of gutta-percha gummed on three edges by pasting it to the skin with chloroform, was devised and used by the writer. It is mechanically more efficient than the original form.

A suction-apparatus, devised by the writer (see p. 93), was used in a number of cases to apply a steady suction force (a partial vacuum accurately regulated) to aid in lung expansion.*

The Wolff bottles were used in a few convalescent cases to promote expansion by expiration.

Respiratory and other exercises were used freely for convalescents.

Mortality.—There were in the whole series 26 deaths, 14.4%. Of the patients under two the mortality was 37%; between two and five 20%; over five only 7.5%, a striking difference.

The mortality according to the infection gives (in cases where the infection was determined)

6 in 33 pneumococcus infections 18%

3 in 8 streptococcus infections 37%

twice as high for streptococcus, a contrast the more striking as the above list of deaths in pneumococcus infection includes one death from scarlatinal nephritis and one from diphtheria.

As to the causes of death:

Exhaustion, malnutrition and slow septic absorption account for 12,

* The negative pressure used with this apparatus was one sufficient to sustain a column of water of from eight to thirty inches, according to the case. The tension is obtained by an exhaust bulb, and remains constant for some hours without any attention.

Early collapse for 4 (there were no deaths on the table).
Persistence of pneumonia for 3.
Probable brain or other embolism for 4.
"Convulsions" 1.
Diphtheria 1.
Scarlatinal nephritis 1.

It is to be noted that the most frequent cause of death is "infection" or "exhaustion"—on the basis of records it is impossible to separate the two. In the cases personally observed there was undoubtedly infection, but the grade of infection of the discharging cavity seems to the writer of secondary importance. The cause of death in many at least of these cases is the profound disturbance of nutrition, due primarily to pneumonia, secondarily in some cases to delay in operating. In the writer's cases forced feeding, concentrated foods, rectal feeding, stimulants, tonics, etc., were used, usually without success. Some patients, especially the older children, show rallying power—the others, especially the little ones under two—grow gradually weaker and die.

Earlier operation may save some of them but the problem is essentially a medical one and I can offer no very helpful suggestions.

The other causes of death—embolism, recurring pneumonia, exanthemata, etc.—are so entirely accidental that there seems no way of guarding against them.

Reexpansion and Healing.—Prompt and full re-expansion of the lung was frequently noted before the patient left the table; this proves that the lung was not tied down in these cases, but such expansion was found to have no definite relation to prognosis of life or healing.

Save that irrigation after operation seems to retard closure, the study of results *in relation to methods* is not very instructive.

The writer had hoped to achieve definite results with the use of suction-apparatus and valves. This has not been the case. It is possible to produce expansion of the lung in this way, and to get more than usually good drainage, but expansion does not, in itself, ensure healing—that also depends upon the nutritive condition, and in the cases with profoundly disturbed nutrition, which are common, the suction method yields only moderately good results. Its proper field is in the later cases where failure to re-expand is the prime factor in failure to heal. In five such cases it yielded most satisfactory results.

The statistical figures will, then, be given without reference to the special method used.

There are a number of cases in regard to which we have no data, others doing well in which too little time has elapsed for final records. Out of 105 cases with complete data,

19 were closed at six weeks,
42 were closed at three months,
27 closed later without operation,
14 closed only after secondary operation,
5 were not closed after years of fistula drainage.

Undoubtedly there may be other chronic empyemas among those not traced, but probably the figures are near the facts. It is noteworthy that empyemas apparently soundly healed may later break down and recur either as localized or extensive empyemata. There were ten cases in our series where this happened, and in two of them the recurrence was two years after healing.

No essential difference is to be made out as to time of closure according as the effusion is sterile or contains pneumococci, streptococci or staphylococci.

The most important item in the prognosis of healing seems to be that of nutrition, an item which unfortunately cannot well be tabulated. After a pretty careful observa-

tion of a good many cases and after much study of records this varying nutrition remains in the writer's mind the essential reason for the widely different course of the disease after operation in apparently similar cases. Here and there cases heal within three or four weeks without trouble—they will be found to be children on whom the preceding pneumonia has made but little impression. Other patients (in some of whom prompt lung expansion at the time of operation shows no "tying-down" of the lung) hang at about the same point for week after week. Some of them finally die; most of them eventually heal, but only after months. The infection is the same in these as in the other cases, the surgical condition the same, with no hindrance to lung-expansion, and yet they do not heal. If we apply suction and expand the lung, as we can do,—still they do not heal. On careful inspection of these cases we often find that even the external wound shows no formation of granulations—evidently there is a failure to form plastic material. It does not much matter in these cases what we do surgically, beyond providing proper drainage: so soon as the general condition so far improves as to provide for healing, they will, with favoring conditions, heal up; until then they will not heal. This is the explanation of the uselessness of artificial expansion in many fresh cases, and in the writer's opinion it is the question of nutrition that dominates the whole question of prognosis.

In regard to deformity following healing it may be said that temporary deformity, a flattening with some spinal curve, is the rule. In the cases seen at this stage the deformity has always promptly yielded to proper exercises. In regard to later results, especially in cases where exercises have not been carried out, the following figures are submitted:

Total 55 giving definite data.

Thirty-one without deformity enough to note.

Nine with slight difference in chest girth or with flattening, without lateral curve.

Six showed slight lateral curvature.

In two the curve is noted without note of degree.

Ten showed severe curvature. One of these was healed at 3½ months, one never operated beyond tapping, in one without data as to length of time the sinus was open. Of the others, four closed only after "over a year," 21 months, 11 months and 4½ years respectively, and three are still open.

The records show that it is possible for cases to have a long continuing sinus (in one case 9 months), and yet heal without deformity, but it is equally clear that the long continuance of a sinus predisposes to collapse of the chest wall and to consequent scoliosis, and that most of the cases not closed at 1 to 1½ years will show permanent deformity.

The *general conclusions* drawn by the writer from the data in hand are:

Empyema in children usually follows lobar pneumonia—after a varying interval.

The infection is usually with the pneumococcus.

Spontaneous cure, even when aided by tapping, is rare.

Operation should not be delayed, as time lost is strength lost, and the issue is largely one of nutrition.

The best form of operation is in general the subperiosteal resection of an inch of the eighth or ninth rib in the posterior axillary line, the evacuation of pus and fibrin masses, and tube drainage.

Irrigation at or after operation is not usually advisable.

The routine after-treatment in fresh cases should be tube-drainage, the tube being progressively shortened, and removed when the cavity is nearly healed.

Where failure to heal seems to depend on failure of the lung to re-expand, treatment by valve or suction apparatus is indicated. This is especially of value in the more chronic cases.

The mortality is about one in seven; in small children much more than in those over five. The causes of mortality are in the main beyond our control.

The great majority of cases heal even when the healing is delayed for many months. Chronic empyema, in the strict sense, is rare in children.

The closure of the cavity depends mainly on nutrition and on adequate drainage.

Recurrences may occur from faulty drainage at any time, and they may occur years after apparently sound healing without obvious cause.

Deformity of the chest is usually temporary and yields to treatment.

Long continued discharge from the cavity is not infrequently followed by chest deformity and scoliosis of a severer type, permanent and sometimes extreme.

ARTICLES V.–X.

VACCINATION AND SMALL-POX.

THE PREPARATION OF ANIMAL VACCINE.

By THEOBALD SMITH, M.D.
OF WEST ROXBURY.

VACCINATION: THE TECHNIQUE.

By EUGENE A. DARLING, M.D.
OF CAMBRIDGE.

VACCINATION: ACCIDENTS AND UNTOWARD EFFECTS.

By JOHN H. McCOLLOM, M.D.
OF BOSTON.

SMALL-POX: ITS DIAGNOSIS.

By JOHN T. BULLARD, M.D.
OF NEW BEDFORD.

LEGISLATION WITH REFERENCE TO SMALL-POX AND VACCINATION.

By SAMUEL W. ABBOTT, M.D.
OF NEWTON CENTRE.

SMALL-POX: ITS MEDICAL TREATMENT.

By MICHAEL KELLY, M.D.
OF FALL RIVER.

READ JUNE 10, 1902.

ARTICLE V.

THE PREPARATION OF ANIMAL VACCINE.

By THEOBALD SMITH, M.D.,
OF WEST ROXBURY.

The necessity for the vaccinal protection of the individual against such a subtle and pervasive virus as that of small-pox is answered in but one way by the experience of the century just passed. Without the specific protection given the community by vaccination, small-pox cannot be efficiently controlled and suppressed.

The acceptance of this proposition by the medical profession and the State creates the responsibility of supplying as pure and efficient vaccine virus as can be made under present conditions. The preparation of animal vaccine is in itself simple enough, and this very simplicity is a source of danger, because the production may be undertaken by such as are not sufficiently trained in scientific methods to apprehend and utilize the improvements wrought by investigation, as well as to anticipate and guard against the dangers due to altering conditions.* Simplicity of manufacture and the lack of a definite scientific code of proce-

* In this regard it differs from the preparation of diphtheria antitoxin, because the latter substance cannot be prepared excepting by those having had considerable technical training. Its successful manufacture necessarily implies that degree of care which also ensures the safety of the product.

dure as regards details of preparation make safeguards of all kinds all the more necessary. It is the safeguards which represent by no means insignificant items of cost, for they mean the employment of trained persons to apply such routine tests as may be deemed necessary to eliminate dangers, and they demand the free use of animals for control observations and tests.

THE NATURE OF VACCINE.

Much has been said and written upon the original source of vaccine virus as an important factor in its efficiency. Since the day of Jenner, who considered cow-pox as a derivative of grease of the hock in horses, there has been more or less fluctuation of opinion as to the nature of cow-pox itself. The findings of the celebrated Lyons Commission in 1865 controlled for a long time the views of the medical profession. This commission, while admitting that small-pox virus may be successfully inoculated into the cow, denied that it underwent any mitigation or modification, and that, returned to man, it would produce genuine small-pox. Since that time a considerable number of investigators have succeeded in transmitting small-pox to the cow and producing genuine cow-pox, and it is now quite generally regarded as a derivative of small-pox.[1] The frequent appearances of cow-pox in the early years of the nineteenth century were in all probability due to the accidental inoculation of the cow with small-pox or with vaccine from the hands of the milker, which in its turn was at some earlier time derived from small-pox by passage through the cow. Vaccine, derived from variola, the so-called variola-vaccine, was prepared by Voigt, of Hamburg, in 1881, and it has been used by him with success ever since. Recently a new stock of variola-vaccine has been prepared successfully in Munich, Bavaria.[2]

With the fact before us that vaccinia is small-pox pro-

foundly modified by its passage through the cow, and that it may be reproduced whenever needed, the assumed danger of cow-pox virus dying out may be regarded as non-existant. But the subtle differences in vaccine from different sources and the opinions of experienced men, that vaccine may in time become less efficient, makes the constant control of vaccine upon susceptible children to determine its taking qualities a matter of great importance.

THE PREPARATION OF ANIMAL VACCINE.

The microörganisms of variola and vaccinia have not yet been recognized by the microscope, and their presence can be determined only by their effects. This gap in our knowledge is largely responsible for the divergencies in the preparation of vaccine witnessed to-day. The microörganism of vaccinia is present in the proliferated epithelium of the inoculated skin of the cow, as well as in the serum or lymph which exudes from the vesicle and its base after the overlying scab or crust has been removed.* Two methods are based on these facts. In the one, now used throughout the continent of Europe, in England, and to a large extent in our own country, the proliferated epithelium along the line of inoculation is scraped away and it becomes the basis of the vaccine. It is the so-called pulp. The other method utilizes the fluid lymph or serum of the vesicle. This method is still used to a restricted degree in our own country.

In the preservation of the virus two methods are in vogue. In Europe, and to a considerable extent in our own country, the pulp is mixed with diluted glycerine and stored in sealed receptacles. Less used to-day is the

* The microörganism is also present in the internal organs of the inoculated calf, for typical vaccine eruptions were produced by the recent German Commission[3] with the fluid from crushed spleen tissue and from lymph nodes. Positive results were obtained from one calf forty-four days after inoculation. These results need repetition and confirmation.

method once universal in our country, of drying the vaccine on the ends of flattened slips of ivory or bone, the so-called vaccine points.

Let us now look hastily at the concrete processes, and in so doing let us glance first at the procedure now in general use — the preparation of glycerized vaccine.

Calves are chiefly employed. The preferred areas for inoculation are the abdomen, the inner aspect of the thighs, the scrotum, or simply one side of the animal. The thoroughly-inspected, cleansed animal is fastened upon a suitable table, and the areas to be inoculated are shaved and washed. Disinfection of the skin with alcohol, lysol and other well-known disinfectants, is variously practised and omitted by different authorities. In any case certain disinfectants must be removed with sterile water before the vaccine is applied. On this prepared area shallow incisions, barely deep enough to become reddened, are made in parallel lines about one-half inch apart. The vaccine or seed is thoroughly rubbed into the scarified area and the calf released. Much time and ingenuity has been sacrificed by German vaccine producers in the effort to obtain a proper aseptic protective dressing for the vaccinated area, but nothing has been brought forward which has received general approval, and I think that to-day most vaccine producers use no dressing, but depend on general cleanliness.

After four to six days, according to temperature and individual variation, the calf is again placed upon the table. The vaccinated surface is thoroughly washed with sterile water, and any scabs or crusts removed. A curette is then used to scrape away the slightly elevated ridges of epidermis and subjacent layers which represent the confluent eruption following the linear inoculation. This scraped material, or pulp, is thoroughly ground and comminuted in a mortar or a special machine while being mixed with a

definite amount of about 66% of glycerine. When the process of grinding and mixing with glycerine has been completed, the vaccine is, as a rule, stored for at least a month before it is sold or dispensed free, as is done, for instance, in the German Empire. The usual dilution of the pulp with diluted glycerine is one part of pulp to three or four parts of diluted glycerine. The German Commission has shown that a dilution of 1 to 10 is equally efficient and that a dilution of 1 to 20 is still satisfactory in primary vaccination.[4]

From the outline here given there is more or less departure in different institutes. During a visit to a number of vaccine plants of the German Empire and Belgium, some years ago, I was struck with the variation in minor details presumably grounded upon the experience of the individual directors, all of whom had materially contributed to the advancement of the subject through laborious investigations. In some cases older animals are preferred, but, inasmuch as calves are more easily managed, since they have a more delicate skin, and especially since they can be fed on milk, or milk and eggs, in place of the dusty hay, they are generally used. Variations were also noticed in the time allowed for the development of the eruption, in the method of removal of the pulp, in the extent of the scarified area and in the amount of glycerine added.*

The use of fluid lymph dried upon ivory points has had and still has the favor of many practitioners in our country, because of the relative simplicity of the manipulation. After scraping or curetting for the preparation of the pulp, the serum which oozes from the base of the eruption may be used to charge the points. The usual way, however, is to wait longer, up to the seventh day after vaccination. The animal is then secured, the crusts covering the scarified area

* For variations in the method of preparation in American plants see Dr. Pitfield's exhaustive paper in Public Health, July, 1896, p. 136.

are removed, and the subjacent layer of cell débris wiped away. The lymph then oozes out, or its appearance may be hastened by compressing the base of the eruption. The fluid thus obtained is transferred to points in different ways and the latter allowed to dry.

It is of considerable interest to note that vaccine dispensed by different institutes is not derived from one and the same stock. There are three sources available:

1. The virus descended from spontaneous cow-pox and continued through an indefinite series of animals—the true animal vaccine.

2. Virus obtained from animals which have been inoculated with lymph from human vaccine pustules, either directly, or indirectly through a series of calves. This is known as retro-vaccine.

3. Vaccine obtained by passing small-pox virus through the cow—the so-called variola-vaccine.

It would probably be impossible for many vaccine plants to trace the genealogy of their current stock back to its beginnings. In Germany the use of lymph from the arms of children (retro-vaccine) has been a favorite mode of rejuvenating impaired animal virus.

There has been a more or less heated discussion on the part of manufacturers in this country since the introduction of glycerized pulp, as to the relative efficiency and purity of the latter, and the fluid lymph dried on points, which it is slowly displacing. The controversy seems to me largely unnecessary. Both pulp and lymph are fundamentally the same, for both contain the microbe of vaccinia. Schulz of Berlin found that the clear fluid exuding from the human vaccine vesicle, when diluted in 2000 parts of water, still yielded excellent results when used fresh.[4] Similarly the ordinary vaccine from calves produced vesicles in a dilution of 1 to 400. There are, however, several points of difference between the dried lymph and the glycerized pulp to which I wish to allude very briefly.

In the first place, it is highly probable that the vaccinal pulp is much richer in the specific virus than is the serum or lymph. This may not be of any significance at first, but with age the diluter virus, even in a menstruum of glycerine, becomes sooner inactive than a more concentrated virus. In the second place, the virus is less tenacious of life when dried than in glycerine. Its life is furthermore of uncertain duration. Bacteriologists know that the resistance of most bacteria to destruction, when in a dried condition, depends on a variety of factors, and what is true for bacteria is probably true for the microbes of vaccinia as well. Bacteria well covered by a dry film of albuminous matter, or embedded in dried mucus, live very much longer than those not so guarded. The resistance depends furthermore on the relative humidity to which they are exposed while in a dried state. These conditions necessarily fluctuate more or less in the case of points, and make their life period uncertain. Again, the elimination of extraneous bacteria does not proceed in the same way in the dry and the glycerized virus. In the former, the evidence points to a more or less parallel destruction of both vaccine virus and bacteria. In the latter, the vaccine virus possesses much greater resistance to the glycerine than the sporeless bacteria.

These facts in general speak in favor of the glycerized pulp as a more certain and more abundant source of vaccine.* But efficiency is not the only desideratum. Purity

* Information recently received from four large private vaccine establishments in the United States, in answer to some questions addressed to them, shows that only one of the four adheres to the use of the fluid lymph and condemns the use of the glycerized pulp. The others regularly use the pulp which is (*a*) mixed with glycerine and preserved in sealed tubes or other closed receptacles, (*b*) used to charge points without the addition of glycerine, and (*c*) used to charge points after glycerine has been added. The firm preparing the clear lymph dispenses it in the form of dried points and in tubes after glycerine has been added.

I am, furthermore, informed that the demand for the fluid vaccine has been much greater than for the dry points.

and safety are of still greater importance. This brings us to a consideration of the

BACTERIOLOGY OF VACCINE.

For much of the work done on this subject we are indebted to Europe, especially to the German Commission already referred to.[5] Since only the glycerized pulp is used on the Continent, our information is more extensive and detailed in regard to it. It has been known for some years that the fresh vaccine contains large numbers of bacteria. Up to 700,000 per cc. have been found. When 50 to 70 % glycerine is added, these bacteria are slowly destroyed. After one month the number is greatly reduced. After two or three months the vaccine may be regarded as sterile. In the meantime the vaccine virus remains intact up to six months after preparation, and even longer. The bacteriology of the fluid lymph used for points has not been thoroughly studied, at least such studies have not seen the light to any extent. Though one might suppose that this fluid, presumably poorer in vaccine microbes, would also contain fewer bacteria, the recent report of Rosenau[5] does not support such inference. Of 41 points examined, an average of 4,807 bacteria per point was found. Of 51 tubes of glycerized virus an average of 2,865 bacteria per tube was found. His statement that the glycerized virus was too fresh when put upon the market seems warranted by his results, for a sufficient percentage of glycerine acting for four to six weeks should have reduced the number of bacteria below this level. The points, on the other hand, cannot be benefited by time, since the dried virus itself becomes uncertain after two months.

The micro-organisms we are now considering are largely harmless saprophytes, which are in part inhabitants of the normal skin of the calf, in part extraneous invaders of the eruption. The intimate seat of the local disease remains

free from bacteria, and none have been found in sections of the vesicles until the seventh day.[3] They permeate the superficial scab in large numbers. Among them are found fungi and yeasts, spore-bearing bacilli of various kinds, cocci generally classed as staphylococci, *B. pyocyaneus*, and, very rarely, streptococci, together with a great variety of undetermined forms. The untoward effects of vaccination, as occasionally seen in large reddened areas around the vesicle, extensive infiltration and induration of the base of the latter, together with suppuration and the formation of large ulcers, have been, as a rule, ascribed to these bacteria. About seven years ago the German Commission[3] undertook to determine what, if any, relation existed between them and the severer forms of inflammation associated with vaccination. The outcome of prolonged studies of the effect of various vaccines was, that the contained bacteria had little or no effect upon the reaction. A bacteria-free vaccine might in one case produce extensive erysipelatous inflammation, while a vaccine containing many bacteria, among them so-called staphylococci, might have no effect whatever. The examination of excised portions of erysipelatous skin failed to reveal the anticipated streptococci. The cause of these variations was the individual susceptibility or idiosyncrasy of the child, which reacted alike to vaccine, whether sterile or containing numerous bacteria.

In estimating the effect of the pyogenic bacteria of animal life upon the human subject, we must be cautious about making assumptions that they readily produce disease in man, before we have more definite proof. In the meantime, however, no pains should be spared in removing, as far as possible, all organisms whenever this can be done without impairing the vaccine virus. Such a reduction of the miscellaneous bacteria has been attempted by variously modifying the details of the process of producing vaccine.

Pads of gauze and cotton have been applied by Schulz over the scarified skin of the calf with signal success in some cases.[4] Recently Paul,[6] of the Austrian vaccine institute, has introduced, under the trade name of tegmin, a covering made up of beeswax, gum arabic and lanoline, and containing 5% zinc oxid,* which is now undergoing thorough tests in Europe. The careful application of disinfectants to the inoculated area, both before vaccination and before collecting the pulp, is growing in favor. Some have tried without much success to remove the superficial scabs or so-called sloughs, the bacteriological *corpus delicti*, before scraping away the pulp. Extensive experiments were made by the German commission to remove the bacteria by centrifugalizing and sedimenting the diluted pulp. The results were very good, but the vaccine lost so much of the specific virus at the same time that its keeping qualities became impaired. It is probable that by a combination of these improved details a bacteria-free vaccine may be obtainable in the near future, even without awaiting the bactericidal action of the glycerine.

The possible contamination of vaccine with the spores of tetanus bacilli has created consternation among those who see in vaccination one of the greatest safeguards of a dense and constantly intermingling population. The appearance of a number of cases of this dread disease in widely separated localities about three weeks after vaccination naturally enough called attention to the vaccine. But the condition is so rare—practically unknown in Germany, the most thoroughly vaccinated nation—that a second thought and a consideration of the carefully collated cases, so far as obtainable, make the suspicion seem unfounded.[7],[8]. The whole subject is so new that few data are at hand upon which to base any inference. Careful investigations will be necessary to determine to what extent, if at all, tetanus

* Actual composition not published.

spores may germinate and multiply in the vaccinal eruptions of the cow, so that the conditions may hereafter be promptly met. If it should appear that vaccine may be responsible for tetanus, only some unusual accident or gross negligence will explain its rare occurrence.[9]

We have thus far considered only the miscellaneous contaminations of vaccine. The objectionable agents due to definite diseases of the cow are few and easily eliminated. Among them, tuberculosis and diarrhœa are perhaps the only ones I need mention here. Tuberculosis is comparatively rare in calves, and it may be easily excluded by the custom now prevailing in Europe and, I believe, in our best American vaccine plants, of killing the animal after the vaccine has been collected, and making a careful post mortem examination. If disease is found, the vaccine is rejected. It has been claimed recently by some that tuberculosis is hardly worth considering as a source of danger in vaccine. It is true that the chances that tubercle bacilli may be in the vaccine are slight. It is also true that bovine tuberculosis does not appear to-day as the great danger to man which it was formerly pictured to be, but, as I stated recently in another paper, inoculation of bacteria is a process quite different from eating and inhaling them. A vaccination wound may favor tubercle bacilli which might be unable to find a foothold in the normal respiratory and digestive tracts. In short, no one will desire to use vaccine from which the suspicion of tuberculosis has not been removed when it can be done so readily. The tuberculin test, being not infallible, can not take the place of the autopsy. The latter may at the same time reveal other pathological states which might pass unnoticed in the living animal.

HOW CAN VACCINE BE SAFEGUARDED?

Vaccination being an operation prescribed by public authority, vaccine virus is placed in a position differing from

that of any other medicinal agent. The State insists upon vaccinal protection, and justly so, but under existing conditions it can do little or nothing towards assuming any responsibility for the quality of the vaccine used.

The testing or examination for purity and efficiency of animal products used in medicine is a problem of considerable difficulty. In the case of the antitoxins the task is somewhat simpler than for vaccine. There are to be considered (1) the animals yielding the product, (2) the process itself, and (3) the efficacy of the product as a protective agent. If the State should undertake to test the vaccine sold within its jurisdiction, it would be limited to such simple tests as the enumeration of the vulgar bacteria present and a microscopic examination of the vaccine itself. The animal test for stray tubercle bacilli would require four to eight weeks. The search for tetanus bacilli would be laborious and uncertain for small samples. Nothing could be inferred from such examination beyond, perhaps, the age of the virus and the original content of miscellaneous bacteria. No certain clue could be obtained as to the condition of the animals or the care used in preventing unusual and dangerous contamination. The protective power of the lymph could not be easily determined, owing to the many manufacturers and the large number of animals yielding the virus. In any case it would be impossible for the State to guarantee the purity of the many kinds of vaccine made within its border or sent in from without. The task would be enormously expensive and of uncertain value.

There are two ways out of the difficulty. One has been in vogue on the Continent for many years. Each small state or each subdivision of a large state assumes the responsibility of preparing the vaccine itself. I fully realize that in our country such public institutes, without the safeguard of absolute divorce from practical politics, without

the loyal, unselfish support of the medical profession, and without adequate financial support, would, in all probability, be a disappointment, But granting these conditions as attainable the advantages would be very great. There would be possible a close contact between the people using the vaccine and the institution preparing it. Its efficiency and safety would be subject to a continuous control at close range not obtainable otherwise.

Not less important is the advantage of publicity in improvements, as well as failures. There is a dearth of scientific publications upon vaccine in our country, which contrasts very unfavorably with the work done in Europe and the active interest manifested in the minutely detailed accounts of the vaccine institutes and the relative efficiency of their products, as announced annually by the German government. The advances made in this country in the preparation of antitoxins, for instance, have been published almost exclusively from laboratories under public authority.

According to the other alternative, the national government might appoint inspectors for the private vaccine plants, under whose supervision the virus is prepared, tested and officially stamped, just as all antitoxin sold in Germany is tested beforehand in large lots by government experts. The place where vaccine is tested most easily and economically, and where such testing would go hand in hand with a corresponding improvement of the product, is at the source — where it is made.

In conclusion, I may say that the vaccine is but one of three factors which determine the success or failure of vaccination. The others are a satisfactory inoculation technique and the proper care of the wound afterward. These important factors are to be discussed by those who are to follow me on this program.

The following are some of the more recent publications referred to in the text:—

1. Ch. Haccius. Variolo-vaccine. Contribution à l'étude des rapports qui existent entre la variole et la vaccine. Geneve, 1892.

2. Die Thätigkeit der im Deutschen Reiche errichteten staatlichen Anstalten zur Gewinnung von Thierlymphe während des Jahres 1900. Berlin, Springer.

3. Bericht über die Impfstofffrage. Berichterstatter: Dr. P. Frosch. Berlin, 1896.

4. Zweiter Bericht. Berichterstatter: Vanselow und Freyer. Vierteljahrschrift für gerichtliche Medizin u. öffentliches Sanitätswesen. 1899, 17, p. 93.

5. M. J. Rosenau. Dry points versus glycerinated virus from a bacteriologic standpoint. American Medicine, 1902, 3, p. 637.

6. G. Paul. Ueber einige Fortschritte in der Gewinnung des tierischen Impfstoffes und der Aseptic der Schutzpockenimpfung. Wiener med. Presse, 1898, p. 129 et sqq.

7. R. N. Willson. An analysis of fifty-two cases of tetanus following vaccinia. Journ. Amer. Med. Assoc., 1902, 38, p. 1147, 1222.

8. Joseph McFarland. Tetanus and vaccination. An analysis of ninety-five cases of this rare complication. Journ. Med. Research, 1902, 7, p. 474.

9. Huddleston. Medical Record, March 8, 1902.

ARTICLE VI.

VACCINATION: THE TECHNIQUE.

By EUGENE A. DARLING, M.D.

OF CAMBRIDGE.

The two considerations which govern the technique of Vaccination are that the operation shall be successful and that it shall be safe. Danger may come from the use of impure lymph, from unsuitable conditions in the patient, from infection at the time of the operation or during the development of the vesicle. A description of the technique therefore divides itself into four parts, as follows: 1. The selection of the lymph. 2. The condition of the patient. 3. The operation. 4. The after treatment.

1. The selection of the lymph.

This is perhaps the most important factor of all as regards both success and safety, and yet it is the one condition which is beyond the control of the physician. It is well recognized by bacteriologists that lymph taken directly from the vesicles on the calf contains many contaminating bacteria. When the lymph is dispensed dried on bone points a large proportion of these bacteria remain active. Probably most of them are harmless, yet the common occurrence of the pyogenic staphylococci and streptococci in lymph so dispensed constitutes a real danger. The use of

glycerine as a slow bactericide has undoubtedly much diminished, if it has not wholly abolished the danger from this source; but the glycerinated lymph has certain disadvantages which have prevented its universal adoption, and many physicians still prefer the old unpurified lymph. The disadvantages of glycerinated lymph are the slowness with which it dries, and the difficulty which some have in making it "take." The latter may be due to too great dilution, since there are considerable variations in the proportion of successful vaccinations from different lots of lymph from the same source. However, with care in the insertion of the lymph and with proper protection while drying, the percentage of successful insertions may be very satisfactory, if not the 100% claimed by some producers.

In the absence of any feasible method of supervision by the health authorities, and of any practical test of the efficiency and purity of any given lymph short of actual inoculation of a susceptible individual, there must always be an element of uncertainty as to the care exercised in its preparation. There is no reason to doubt that many of the lymphs now on the market are prepared with due precautions, but this is certainly not true of all, and the physician has no means of discrimination. The State compels the child to be vaccinated, and should furnish the lymph for the operation, guaranteed to be pure and efficient. The reasons which justify the manufacture of diphtheria antitoxin by the State apply with even greater force to the production of vaccine lymph, and it is to be hoped that the present movement to place the control of this important matter in the hands of the State Board of Health will succeed.

2. The condition of the patient.

The best age for the primary vaccination of healthy children is between three and six months, *i. e.* after the child is well started in life and before it has begun the trouble-

some process of teething. At this period the constitutional disturbance is milder, as a rule, and the care of the child is much simpler than at a later age. In the case of delicate children, or of those suffering from some constitutional disease, the vaccination may be postponed at the discretion of the physician. Vaccination is contra-indicated when the child is suffering from any inflammatory skin disease, such as erysipelas or eczema, or when it has recently been exposed to any acute infectious disease, such as scarlet fever, measles, mumps or whooping cough. In time of epidemic, or when there has been an actual exposure to small-pox, vaccination may be performed as early as the first week of life, or in the face of circumstances which would ordinarily contra-indicate it, but in individual cases the decision as to its advisability must be left to the judgment of the attending physician.

There is considerable difference of opinion as to the proper time which should elapse before revaccination. In most cases children who have been vaccinated in infancy cannot be revaccinated successfully until after a period of eight or ten years. In Germany, where the matter has been regulated with great care, the law requires vaccination in infancy and revaccination at the age of twelve. The almost complete immunity from small-pox which Germany has enjoyed since the enactment of this law is attributed largely to the compulsory revaccination, and it is reasonable, therefore, to recommend this practice. After two successful vaccinations it is not necessary to repeat the operation except in times of epidemic, when universal revaccination should be insisted upon. The plan which has been suggested of repeating the vaccination at stated intervals, until there is complete insusceptibility, is theoretically correct, but is practically too drastic to be enforced, except in the case of physicians and nurses who are thrown into close contact with cases of small-pox.

3. The operation.

The physician should remember that the operation of vaccination, though insignificant in itself, demands the observance of the ordinary rules of surgical asepsis. The hands of the operator and the skin of the patient should be surgically clean, and only a clean sterile instrument should be used for the scarification. With a little care it is possible to perform the operation without touching the skin of the patient with the fingers, and this source of infection may be entirely eliminated. The most convenient place for the insertion is the outer side of the upper arm. There is no objection to vaccinating on the leg in the case of girls, where it is desirable to avoid disfigurement; but in this location the after treatment requires somewhat greater care to ensure protection and cleanliness. The skin of the patient should be washed thoroughly with soap and water, and afterwards with alcohol or ether, with enough friction to cause some reddening. This removes the superficial layer of the epidermis and dilates the cutaneous vessels, thus aiding in the absorption of the lymph. If there is any hair it is well to shave a small area, but this is rarely necessary. Antiseptics as a rule are not required. For the scarification the best instrument is an ordinary needle, which should be sterilized just before use by heating in an alcohol or Bunsen flame. The lymph may be placed on the skin first, and the scarification done through it, or the skin may first be scratched and the lymph then well rubbed and pricked in, the needle being used for this purpose. It is better to make three or four small insertions than one large one. A scarification no larger than an eighth of an inch in diameter will produce a vesicle and cicatrix from one quarter to one half an inch in diameter. When several insertions are made they should be at least an inch apart. If placed too near one another they are liable to coalesce and form a single large vesicle, which is much more likely to be injured than several small ones.

4. After care.

The arm should preferably be left bare until the lymph has dried. If glycerinated lymph has been used, this may take a considerable time — an hour or more — and in office practice this may cause much inconvenience. When this long wait is impracticable, it is permissible to use a shield for temporary protection. The best shield for this purpose is one of the light linen or paper forms, porous or perforated, and stiff enough to resist crushing. This may be held in place by two or three small strips of plaster. The shield may be left on for a few hours, and should then invariably be removed. The subsequent dressing should be the simplest compatible with cleanliness and adequate protection. It is sufficient for the first five days to wind a strip of sterilized gauze, or a clean handkerchief, about the arm and hold it in place by pinning it to the under garment. After the vesicle has formed, this same dressing is still sufficient in most cases. If there is danger of breaking the vesicle, or if the patient is inclined to scratch it, it may be well protected by a cocoon of absorbent cotton and collodion. A very comfortable dressing may be made by using two square pads of folded gauze, one three inches in diameter and the other a little smaller. The larger one has a hole cut in its centre, large enough to include the vesicles, and is held in place by two strips of zinc oxide plaster. The smaller pad is then pinned on so as to form a lid over the hole. This dressing has the advantage of permitting the inspection of the vesicles without disturbing it. If the vesicles break down and suppurate, they should be washed daily with boiled water or a mild antiseptic, and kept bandaged with sterilized gauze. If the itching is intolerable, a little aristol or some other mildly antiseptic powder may be dusted on. Occasionally a scab forms having a few drops of pus under it and some œdematous granulations. Such a scab should be carefully removed,

and the granulations should be cut off with a pair of flat-curved scissors. This proceeding is entirely painless and leaves a clean, healthy surface, which usually heals rapidly under mild antiseptic treatment.

Shields as permanent dressings are to be condemned, without exception. The transparent celluloid ones, which have been used so widely of late, are especially bad. If insufficiently ventilated they confine the perspiration, and this macerates the skin of the enclosed area, making it more or less red and œdematous. If the sides are perforated, to allow the free access of air, lint is rubbed off from the inside of the under shirt and accumulates inside the shield. Sometimes this lint forms a feathery mass looking much like a growth of mould. It is, of course, not sterile. Furthermore, the circle of plaster, which is employed to hold the shield in position, is very irritating to delicate skins, and often causes an eczematous eruption which greatly increases the discomfort of the patient. The only advantage which shields possess is their stiffness, which affords more protection against injury to the vesicles than a simple bandage, but this advantage is wholly counterbalanced by the disadvantages mentioned.

The simpler the after treatment, the more likely it is to be carried out. The physician should always give detailed instructions to the patient, or, if the latter is a child, to the parents or nurse. This precaution is often neglected by the busy practitioner, or the instructions given are so general as to be of little value. Emphasis should be placed on the importance of cleanliness and protection from injury. The patient should be warned not to scratch the arm nor to prick the vesicles. He should also be cautioned not to apply vaseline or any other greasy substance to relieve the itching, as this softens the epidermis and may cause the vesicles to break down and suppurate. Ignorance and carelessness on the part of some patients are unavoidable,

but personal attention to details on the part of the physician will do much to obviate this source of danger. The responsibility resting upon the physician in this matter is not a light one. If mishaps occur he is always blamed, whether justly or not. The sources of danger, as already pointed out, are not entirely under his control, but it is his duty, as well as his interest, to observe every precaution which will minimize the danger of vaccination, and yet afford his patients that immunity from small-pox which is one of the greatest blessings conferred on mankind by the art of medicine.

DISCUSSION.

Dr. J. H. McCollom, of Boston: I heartily coincide with Dr. Darling's ideas, and it seems to me that he has brought up some very interesting points.

Having had a large experience, both before and after the epidemic of last fall and winter, I must confess that I think the majority of sore arms are due not so much to the carelessness of the individual, as to the physician in not giving sufficient directions.

ARTICLE VII.

VACCINATION: ACCIDENTS AND UNTOWARD EFFECTS.

By JOHN H. McCOLLOM, M.D.
OF BOSTON.

In this paper no attempt will be made to prove the protective power of vaccination, a self-evident proposition, neither will anything be said regarding the technique of vaccination; these subjects having been ably treated in other papers presented to the Society to-day. It must be taken for granted that vaccination is an operation and that any operation no matter how slight may be followed by injurious effects, if there is carelessness in its performance or in the subsequent care of the wound. When we take into account the immense number of individuals vaccinated each year and the remarkable rarity of any serious results, the wonder is, if vaccination is such an injurious procedure as is claimed by its opponents, that there are not more disastrous effects. Many of the alleged injurious effects after careful investigation have been proved to have no connection with vaccination either directly or indirectly, but have been shown to be due to carelessness on the part of the individual.

It has been alleged that syphilis is frequently caused by vaccination. While this may have been possible in certain rare instances when humanized lymph was used, it is impossible when bovine lymph is employed. It has happened

to the writer in several instances to investigate alleged occurrences of communication of syphilis, but in each case careful investigation revealed the fact that the individuals were suffering from the primary lesion of syphilis at the time they were vaccinated and that vaccination was used as a cloak to cover this condition. As an illustration of the manner in which vaccination is unjustly accused of conveying syphilis Dr. Cory, in his Theory and Practice of Vaccination describes very aptly the following case of a child whose father contracted syphilis shortly after his marriage. Dr. Cory says: * "It was the second child of the marriage; the first died within a very short period of birth. This child, being apparently healthy, was vaccinated at St. Thomas's Hospital in 1878. It was duly inspected, and was brought again with the eruption, which first appeared on the tenth day after vaccination. This is a very good example of the cases of alleged syphilis after vaccination. It is so tempting for parents to lay the results of their own iniquities upon vaccination, especially when they are encouraged so to do by shameless agitators. To enable us to view the truth of these allegations against vaccination, we will suppose a man to have had syphilis and to play a game of football; he receives a kick on the shin, and in due course a syphilitic node may develop from the bruise. The man would be as entitled to say he acquired his syphilis from playing football as a parent of a child who has had syphilis would be to say that the child acquired its syphilis from vaccination."

Erysipelas may follow vaccination but there is no proof that the specific organism of this disease is in the vaccine lymph. Erysipelas also frequently follows the scratch of a pin or any slight abrasion, but this is no argument against vaccination but it is an argument for the careful protection of the vaccine vesicle. Urticaria may follow vaccination

* Lectures on the Theory and Practice of Vaccination. By Robert Cory, M.A., M.D. Cantab., F.R.C.P. London. Page 65.

just the same as that the ingestion of fish and other food may also cause this troublesome eruption. Impetigo contagiosa sometimes appears after vaccination, but as impetigo is an extremely common disease there is no proof that the vaccination is the cause of this manifestation, as the disease is fully as frequent among children who have not been recently vaccinated as among those who have been recently vaccinated.

Abscesses in the axilla may follow a vaccination but this condition is extremely rare and in my experience it has always been due to some carelessness on the part of the individual.

The site of the vaccination may slough, but I have never seen any serious result other than a somewhat tedious healing follow this condition. When this sloughing takes place it is always due either to a diminished vitality of the individual or carelessness in using the arm.

It is doubtful if cutaneous tuberculosis is ever communicable by vaccination, but the abraded surface if brought in contact with the sputum of a tuberculous patient may be infected. This is only another argument in favor of carefully protecting the site of the vaccination. As illustrating how the abraded surface may become infected with micro-organisms the history of the following case is of interest. A child four years old was vaccinated with bovine lymph in the usual way. The vaccine vesicle passed through its regular stages and in due process of time the crust separated leaving a slightly abraded surface. Shortly after this a small patch of a membrane having the clinical appearance of a diphtheric membrane appeared on the abraded surface. Cultures taken from this membrane revealed the presence of the bacilli of diphtheria. The child was not seriously ill and after a short time the membrane disappeared. Investigation proved that a sister of this child was suffering from a mild attack of nasal diphtheria, as proved by a bacteriological

examination, and no doubt infected the vaccinated patient with the micro-organism of diphtheria. Certainly vaccination of itself could not have caused diphtheria. If diphtheria can be communicated in this way certainly tuberculosis may be.

Within the past year there have been several instances in the country of tetanus alleged to have been communicated by vaccination. It is a matter of very great doubt if the vaccine lymph, unless prepared with a total lack of care such as is incomprehensible, ever contains the bacillus of tetanus. Dr. Joseph McFarland has investigated this subject very carefully and throughout the whole extent of the country he was unable to collect more than 95 cases. Considering the immense number of people vaccinated during the past year, if the lymph was at fault, it is hard to understand why there were not more cases of tetanus. An equal number of injuries with a toy pistol or a rusty nail would be followed by a vastly greater number of cases of tetanus. The conclusion which Dr. McFarland reached in his exhaustive paper are as follows:*

"1. Tetanus is not a frequent complication of vaccination, a total of ninety-five cases having been collected.

2. The number of cases recently observed is out of all proportion to what has been observed heretofore.

3. The cases are chiefly American and occur scattered throughout the eastern United States and Canada.

4. They have nothing to do with atmospheric, telluric, or seasonal conditions.

5. They occur in small numbers after the use of various viruses.

6. An overwhelming proportion has occurred after the use of a particular virus.

7. The tetanus organism may be present in the virus in small numbers, being derived from the manure and hay.

* The Journal of Medical Research. Vol. VII., No. 4. May, 1902. Page 492.

8. Occasionally the number of bacilli becomes greater than usual through carelessness or accident.

9. The future avoidance of the complication is to be sought for in greater care in the preparation of the vaccine virus."

During the past year there have been eighteen instances of dermatitis herpetiformis in Boston and vicinity following vaccination, and it has been alleged that this disease was due to vaccination. While it is perfectly true that these attacks followed vaccination there is no proof that vaccination caused them, as this disease has been observed in many cases where the individuals had not been vaccinated. Attacks of this disease occur after confinement and are described in works on dermatology. One instance of this kind has come under my notice. Several other cases which could have no possible connection with vaccination have also been observed. I must confess that I have been unable to gain any light on the etiology of this disease. The following account of the autopsy on the body of a man who died from this disease, taken from the records of the Pathological Department, Boston City Hospital, where the autopsy was made, may be of interest. It must be borne in mind that although the man had been vaccinated some five or six weeks previous to his illness there was no irritation at the point of inoculation and nothing to indicate that the vaccination had anything to do with the disease.

* CLINICAL DIAGNOSIS, DERMATITIS HERPETIFORMIS.

Autopsy 13 hrs. post mortem.

Age 42 yrs. Body length 174 cm.

White man, strongly built, fairly nourished. Body warm. Some rigor; lividity of dependent parts; pupils normal and of equal size; no œdema.

Scalp covered with scaly crusts. Corners of mouth and nose thick with dark clotted blood. Exudate on lids, and

* Taken from Records of Pathologieal Department, Boston City Hospital.

left lid discolored. Over clavicles a large excoriated dark red area on either side, irregular, not deep, showing thin crusts at borders and over part of its surface. The whole back from neck to fold of buttocks a mass of similar dried lesions. These areas also are distributed over chest and in axillæ and groins. Surface of the palms show scaly crusts. Nowhere are there vesicles or blebs, all the lesions being dry. Lower legs free except lesion size of a quarter over head of left fibula and one over left outer surface of leg above malleolus. Deepest excoriations appear to be over coccyx, centre of back, and right buttock. Elbows, outer side of right and inner aspect of left running up to above deltoid tubercle show deep involvement with lesions similar to those described above.

Peritoneal cavity.—Appendix lies behind the cæcum, is curled in a "watch spring" spiral, has no mesentery, is 6 cm. long and is adherent to the cæcum. Mesenteric lymph nodes are normal. Diaphragm extends to 5th space on the left side, 5th rib on right side. There is nothing notable on the peritoneum covering the intestines, stomach or parietes.

Pleural cavity.—On removing the sterno-costal trap the lungs bulge forward prominently, nearly meeting in the median line and partially obscuring the pericardium. The lungs are everywhere free save for a few fibrinous shreds, stretching from the left lower base of the underlying diaphragmatic pleura. The left pleural cavity contains about 30 cc. straw-colored clear fluid.

Pericardial cavity.—The pericardium is everywhere normal. There are about 25 cc. of straw-colored clear fluid in the cavity. Pulmonary artery opened in situ contains white elastic non-adherent clot.

Heart.—Normal size. A trifle flabby. Cut surface of myorcardium is brownish red. Endocardium presents the tiger-lily picture. With the exception of the mitral, the valves are normal. The mitral segments are retracted, and thickened irregularly at the borders; the chordæ tendineæ are shortened and stiffened. Coronaries normal.

Frozen section of the myocardium shows minute fat droplets in the intrafibrillar sarcoplasm.

Measurements:	Tricuspid valve,	12.5	cm.
	Pulmonary valve,	7	cm.
	Mitral valve,	9.5	cm.
	Aortic valve,	7	cm.
	Left ventricle,	1.5–2	cm.
	Right ventricle,	5	cm.

Lungs.—Pleura smooth, dirty gray in color with usual carbon tracery. Right lung voluminous; on section marbled by alternating areas of bright red and gray; the great part crepitant, but throughout are firm airless areas somewhat granular. In places fine bubbles of air or dirty puriform fluid exudes on pressure.

Left lung.—Upper lobe similar to right lung except for fewer areas of hyperæmia and more œdema. Lower lobe solid, airless. The diaphragmatic surface of this lobe is roughened by yellowish fibrinous tags. Section at this point leads into numerous small cavities near the surface filled with extremely foul-smelling greenish necrotic material, smear from which shows numerous lanceolate cocci in pairs and short chains, smaller flattened cocci in chains and a stout bacillus all staining by Gram. The remainder of the lobe is dirty reddish gray in color, firm, moist, with a certain tenacious, almost mucoid exudation on the cut surface admixed with numerous air bubbles. A section sinks in water.

Beginning with the primary bronchus, the bronchi everywhere throughout both lungs are filled with a dirty gray, at times blood-tinged, offensive muco-purulent exudation. The bronchial lymph nodes are deeply pigmented and present nothing remarkable on section.

Spleen wt. 120 gms. Capsule wrinkled. Pulp soft, red-brown. Malpighian bodies appear as irregular spheroids of gray white, measuring sometimes 2 mm. in diameter. Trabeculæ and blood-vessels prominent.

Liver wt. 2320 gms. Surface smooth, yellowish red. Cut section yellow-red with occasional pale area. Markings fairly distinct.

Pancreas normal.

Kidneys wt. 390 gms. Capsule peels readily, leaving smooth surface. On section dark brownish red, markings regular, glomeruli evident. Cortex measures 7 mm. to 1 cm. Frozen section does not show fat.

Adrenals rather large; normal in appearance on section.

Bladder not remarkable. Prostate of average size; testicles pull out readily.

Aorta normal.

Organs of neck.—Pharynx rather injected and granular, but no sign of vesicles or ulcerations either about tonsils, uvula or tongue.

The larynx and trachea are covered in irregular patches by a yellowish green muco-purulent material which in one place forms a narrow line extending from the larynx to the bifurcation of the bronchi. This substance is extremely tenacious, being removed with difficulty from the tracheal mucous membrane. Besides this the trachea contains a considerable amount of dirty gray semi-fiuid material, which empties itself on section of the organ.

Gastro-intestinal tract.—The lesser curvature of the stomach shows a patch 6 cm. in diameter, composed of discrete and confluent tuft-like areas of capillary injection. A few small hæmorrhagic spots observed elsewhere on mucosa.

Save slight injection of surface of rugæ at irregular intervals, the small intestine is normal. Colon shows slight injection in its upper part.

Brain wt. 1485 gms. Normal. Pial surface quite wet.

ANATOMICAL DIAGNOSES.

Extensive lesions of skin.
Gangrene of lung (left lower lobe).
Acute lobar pneumonia (left lower lobe).
Broncho-pneumonia (right lung, left upper lobe).
Acute bronchitis, tracheitis, laryngitis and pharyngitis.
Acute gastritis.
Hydrothorax.
Chronic mitral endocarditis.
Fatty degeneration of heart.
Acute splenitis.
Acute fibrinous pleuritis (left lobe).

While the result of this autopsy explains the cause of death, it does not throw any light on the etiology of the disease. So far as is known the bovine species are not af-

fected with any disease resembling in the slightest degree dermatitis herpetiformis. If vaccination was the cause of the cutaneous manifestation in this instance, it would be reasonable to suppose, considering the immense number of people who have been vaccinated in the past hundred years, that some physician would have recognized and reported similar cases. The literature of vaccination is sterile on this point.

In the Sixth Report of the Royal Commission of England, Appointed to inquire into the Subject of Vaccination with Minutes of Evidence, and Appendices, the following statement is found: —

* "It is true that in a considerable number of the cases examined for us the injury or death is reported to have been only indirectly due to vaccination. Insanitary surroundings and parental ignorance, or even parental neglect, are assigned in some cases as the causes of complications. But even in such cases it is clear that, apart from the vaccination, the contributory causes alone would not have produced the results admitted. An operation which for its safety requires complete sanitation, with care and skill on the part of every mother, would seem to be scarcely a fit matter for universal compulsion."

This paragraph was written by the opponents of vaccination after a most searching investigation, taking many months, and they were unable to bring forward a single instance of death due directly to vaccination. There is no mention of any case of dermatitis herpetiformis. If the cases to which allusion has just been made were the direct result of vaccination, the question very naturally arises, why have not these cases been observed in England as well as in this country?

In order to obtain the consensus of opinion of the mem-

* Sixth Report of the Royal Commission at England, appointed to inquire into the Subject of Vaccination, with Minutes of Evidence and Appendiees. 6 & Final. 1896–1897.

bers of The Massachusetts Medical Society, the following circular was addressed to each member of the Society:

Boston, April 15, 1902.

Dear Doctor:

At the next meeting of The Massachusetts Medical Society one of the subjects for discussion will be Vaccination. I have been asked to collect statistics regarding its injurious effects. You will confer a favor on the Society by answering the following questions.

Please mail as soon as convenient, in the enclosed envelope, your replies.

Yours truly,

JOHN H. McCOLLOM.

To Dr.——

1. How long have you been in practice?
2. How many individuals, approximately, have you vaccinated?
3. What injurious effects, due to vaccination, have you observed?

Twenty-seven hundred circulars were mailed and replies have been received from eighteen hundred and fifty-nine individuals. It was thought that in this way valuable information from a large number of physicians practising in different parts of the country could be obtained. The experience of 1859 physicians whose professional life ranged from six months to sixty years, aggregating 29,631 years of practice and 2,525,083 vaccinations, would be valuable testimony for or against vaccination, so far as injurious effects are concerned.

In the replies from 1701 physicians the statement is made that no injurious effect has followed vaccination. Moderately severe effects, in which the individuals were unable to attend to their business for four or five weeks, were reported in 68 instances. In 54 instances there were extremely severe results of vaccination; namely, severe cellulitis, 28; erysipelas, 9; extensive sloughs, 5; poisoning from the dye of underclothing, 2; cases of dermatitis herpetiformis, 6. In two instances where diabetic patients were vaccinated there

were somewhat extensive sloughs on the arm, which eventually healed. There were two cases of syphilis alleged to have been contracted from vaccination. The deaths reported to have followed vaccination were 35; namely, tetanus, 11; erysipelas, 4; dermatitis herpetiformis, 12; septicæmia, 3. In two instances the cause of death was not given. In one case tuberculosis was alleged to be due to vaccination. In one instance a chronic nephritis was said to be exacerbated sufficiently by vaccination to cause the death of the individual, and one death came from pyæmia. In regard to the deaths in six instances, the connection between the vaccination and the death of the patient was certainly problematical. Of the 11 deaths from tetanus two were certainly not connected with vaccination. In one of these cases, although tetanic convulsions were present, the autopsy proved the existence of tubercular meningitis. In the other there was a septic wound which it is reasonable to suppose may have become infected with the tetanus bacillus.

As illustrating the protective power of vaccination the following statement of a physician, who was a medical student in 1857, is of interest. This man, after having been vaccinated with humanized lymph, inoculated himself two or three times with virus taken from a patient ill with the small-pox, without any injurious results.

One physician who was a surgeon in the army during the Spanish-American war reports that the 8th Massachusetts Regiment was revaccinated four times during a year, and also that the 46th Regiment was revaccinated seven times without causing loss of time on account of sore arms. A Health Officer in one of the cities of a neighboring State, reports that he vaccinated 30,000 individuals without any deleterious results.

The report from an institution where 1500 prisoners were vaccinated without injury would seem to prove the innoxiousness of the operation.

In the United States navy a surgeon in the service reports 5,000 vaccinations without a single man being placed on the sick list. The reports from many of the smaller institutions also show a similar immunity from particularly sore arms.

During the past year a very large proportion of the attendants and patients at the Boston City Hospital have been vaccinated. I have carefully watched these vaccinations and I have failed to discover any instance of marked discomfort to the individuals.

At the South Department during the year vaccination has been general. In no instance have the patients or attendants suffered anything more than a slight and temporary discomfort. It is certainly true that vaccination is unjustly held responsible for many manifestations which would occur in the natural course of events if the individuals had not been vaccinated. For instance, one physician reports a case of appendicitis occurring one week after the patient was vaccinated, and the same man also states that a patient who had been vaccinated four days previously developed an abscess of the face due to a carious tooth. It is due to this man to say that he did not attribute these occurrences to the vaccinations, but that the relatives and friends of the patients did.

Two instances of death following vaccination, occurring in a neighboring city and attributed by many of the friends to vaccination, are examples of the manner in which vaccination suffers. One was the case of a child who was vaccinated four days previous to a fall which caused a fracture of the skull, the other was that of a patient who died from pneumonia one week after vaccination. I have investigated some six deaths alleged to have been due to vaccination where there was no irritation of the arm, and the cause of death was, without the shadow of a doubt, due to gastro-enteritis.

If the reports of the 2,525,083 vaccinations are summarized it will be found that in 2,516,684 cases there were no injurious results; that in 68 instances there were moderately severe results; that in 54 cases extremely severe effects were noted, and that the deaths numbered only 35.

If 2,525,083 subcutaneous injections of morphia in ordidary doses were given there is no doubt that there would have been a much larger number of deleterious effects.

If there had been a simple scarification of 2,525,083 arms there certainly would be nearly as great a number of cases of cellulitis and erysipelas as has been found after vaccination, and there is no doubt that there would have been a certain number of deaths due to the abrasion of the cuticle.

It would seem, therefore, both theoretically and practically, judging from the reports of 1859 physicians, that the following conclusions are justifiable: —

1. That vaccination should be carefully done with aseptic precautions.
2. That the after treatment of the site of the scarification is very important in preventing cellulitis, erysipelas and tetanus.
3. That vaccination when carefully done with properly prepared lymph is a harmless procedure.

DISCUSSION.

Dr. Francis D. Donoghue, of Boston: The case I wish to report is of extreme interest from the fact that without operation a fatal case of peritonitis might have been recorded as attributable to vaccination. The case occurred in the practice of Dr. R. P. Loring of Newton Centre, who conducted the post-operative treatment, and to whom I am indebted for notes of the case, and was seen and operated upon by Dr. Mixter, who has permitted this report.

Female, aged three years eight months. Was vaccinated on the left leg, Oct. 25, 1901. The vaccination pursued the usual course for a successful take.

On Nov. 4, she was taken with pain in the abdomen indistinct in location. There was rather more tenderness in the right iliac region than elsewhere, occasional vomiting, pulse 140, temperature 104.

Nov. 5, no change. Nov. 6, seen by Dr. Worcester of Waltham, in consultation with Dr. Loring. Symptoms same as on 4th, pulse 120, temperature 103. Nov. 7, seen by Dr. Mixter. Not much change in the condition. Glands in left groin slightly enlarged and tender, but there were no localizing abdominal symptoms. On account of the indefinite nature of the symptoms no operative interference seemed indicated. Nov. 9, condition about the same, except for some rigidity of the right rectus muscle. Temp. 104, pulse 14.

Longer delay did not seem advisable, and laparotomy was performed. Incision was made through right rectus muscle, and a gangrenous appendix was found in a partially walled off cavity containing pus. Culture taken showed pure colon bacillus.

Appendix removed, incision closed and gauze drainage. Convalescence uninterrupted.

Dr. G. H. French, of Dorchester: I would like to ask the writer how he would consider the question of vaccinating a person who had at the time some acute febrile disease. Would it be safe, for instance, to vaccinate a patient sick with a severe attack of the grippe?

Dr. McCollom: In answer to the question, I would say, if the patient has been exposed to small-pox, I should certainly vaccinate. I speak with some assurance, because I have vaccinated patients in the South Department with scarlet fever and diphtheria during the acute stage of these diseases, and have seen no ill effects from so doing.

One point which I would like to have brought up here is the vaccination of pregnant women. It seems to me very important.

ARTICLE VIII.

SMALL-POX: ITS DIAGNOSIS.

By JOHN T. BULLARD, M.D.
OF NEW BEDFORD.

In many cases the diagnosis of small-pox can be made at once from the eruption itself and without hesitation, while in others the decision can be made with certainty, but only after a few days of observation. It is in the milder and modified forms of small-pox, however, that considerable difficulty or even impossibility in making a correct diagnosis occurs, and it is through these patients that the disease is usually transmitted to a large number of others. It becomes often a most difficult matter for a health officer, called in perhaps for the first time in the stage of desquamation, to decide from the imperfect history he is usually able to glean, whether the case has been one of small-pox, should be immediately removed, a large number of people quarantined, or whether the malady has been a varicella and no precautions are demanded.

It should be borne in mind that several facts beside the eruption are of value, and should receive consideration in each case.

The first question that should be asked is: Has the patient in any way been exposed to small-pox? In epidemics where exposures can be easily traced, we are enabled to de-

cide very early in the disease what we have to deal with, and are justified in sending our patients early into quarantine, thereby lessening the danger to others. While the history of exposure can not, many times, be ascertained, it is well to remember that no case of small-pox originates *de novo*, and careful questioning may reveal some friend or neighbor who has had a recent eruption, and investigation of the latter case may throw considerable light upon the one under consideration.

Secondly.—Has the patient been vaccinated, and if so how recently? In an epidemic of about 175 cases in New Bedford in 1900, nearly all occurring in French-Canadians, 95% of the victims were unvaccinated, and in many households the unvaccinated were affected and those vaccinated escaped. A pertinent question also, is, "Has the patient ever had chicken-pox?" Age also has some diagnostic value. While chicken-pox is essentially a disease of childhood, small-pox attacks all ages equally.

Next come the constitutional disturbances which occur before the eruption. Notice the sudden onset, the rise in temperature, rigors or chills, often nausea and vomiting, severe frontal headache, and backache,—in fact, the usual symptoms of any acute febrile disorder. All writers lay especial stress on the severe and peculiar backache corresponding to the lower dorsal, lumbar and sacral vetebræ, and some state that it is hardly ever absent, and is almost "pathognomic."

Especial care was taken by the writer and his associates on the Health Board to investigate this symptom during the epidemic above referred to, with the result that they found it not at all a prominent symptom, being absent entirely in many cases, and in others complained of as merely a dull aching low down in the back. Severe frontal headache was much more prominent and frequent. The consensus of opinion, however, points to backache as of consider-

able diagnostic value. In mild cases these prodromal symptoms may be present either with the same intensity as in the severe ones, or they may be greatly modified and not pass beyond a period of feverishness and malaise.

If a diagnosis is attempted at this stage, influenza must be remembered. The symptoms are very similar, and many errors have been made, by both physician and patient thinking that the case was one of grippe, the patient being discharged before the appearance of the eruption.

During the stage of invasion, usually on the second day, in a small proportion of cases a so-called initial rash of two different forms may appear, either erythematous as a scarlatina or blotchy as in measles, and may lead to an error in diagnosis; although sometimes general, as a rule they affect only the lower part of the abdomen and inner surfaces of the thighs, usually are transient, fading away in twelve to twenty-four hours. Here the diagnosis may be made of scarlet fever. The longer duration and the severity of the premonitory symptoms, the unusual location of the rash, the duller red color of the erythema and the absence of severe angina and enlarged cervical glands should enable the physician to at least lean toward small-pox. Erysipelas should be borne in mind, but its method of spreading and its peculiar glazed appearance do not offer serious difficulty in recognition.

In the papular form of initial rash, we have a certain similarity to measles. The catarrhal symptoms of measles are not prominent in small-pox.

These prodromal rashes last only a few hours, and are not a serious obstacle to diagnosis.

The true eruption itself must now be considered. On the fourth day macules appear on the forehead, around the roots of the hair, and about the mouth, nose and eyes, the temperature drops to normal, and in mild cases may remain so until the end of the disease. I know of no other

disease where the temperature curve acts like this. These macules become papules and indurated, and by the next day present to the touch a shotty feeling, due to the anatomical arrangement in the skin. These lesions by the next day or two appear on the trunk and extremities, the feet being the last part affected.

Then follow the vesicles, at first minute and then larger, then umbilication, and about the sixth day of the eruption pustules, suppuration, fever, and lastly dessication, taking place first in the centre of the pustule and finally the transformation into a dark brown or blackish crust.

This eruption may be discrete or confluent. It may also be hæmorrhagic when ecchymoses appear in the skin and conjunctivæ in the prodromal stages and into the lesions themselves afterwards.

These are the so-called "text-book cases" and can be quickly passed over as the diagnosis is readily made, and we will consider the milder cases and with what diseases they may be confounded.

In so-called varioloid, called also modified small-pox and pseudo small-pox, occurring especially in the vaccinated, and in certain recent epidemics, the errors in diagnosis are frequent, and the fact that in many cases the services of a physician are not called for, does much to favor the spread of the disease. The erythematous initial eruption is mentioned as being more often met with in the milder epidemics, but in our experience it was seldom met with, or if present was of so transient a nature that it escaped observation. To add to the difficulty of diagnosis the eruption often is abortive, going no further than the papular stage; or it may progress to a small vesicle which soon shrinks; or may become sero-purulent, stop there and dessicate. We had two cases that were surely small-pox, in which after some severe constitutional symptoms the eruption never developed at all.

There are many cases where there is no secondary fever, and the patient is convalescent after the appearance of the eruption, which may be extremely scanty.

I had the opportunity to see one case recently where with moderate prodromal symptoms the rash was limited to a few lesions on the face, perhaps half a dozen, only two of which became pustular. A few papules appeared on the chest on the following day. These lesions quickly dried up, but there was considerable induration, and knowing the exposure and history of the case there was no doubt that the disease was small-pox, occurring in a man who had been successfully vaccinated some eight years previously. Here, without the history, the diagnosis would have been extremely difficult.

What eruptions are liable to be confounded with small-pox?

Pustular Eczema may at first deceive the practitioner. The history of the case, including absence of constitutional symptoms, the absence of throat symptoms, and the distribution of the rash, should enable the physician to make a diagnosis. There is also a lack of well-defined progressiveness to the lesions. The vesicles and pustules are small and arranged on an inflamed base which is larger than the papule of small-pox.

Syphilis.—The similarity is often so close as to deceive even the most experienced. There is an identity of anatomical forms and also of evolution through the stages of papule, vesicle and pustule. Hutchinson says: "The simulation of the variolus eruption by syphilis is the most marked example of syphilitic imitation. The papules are elevated, shotty to the finger, have depressed centres, affect the same regions as small-pox, and resemble it so absolutely that nothing but the history of the case can help the surgeon to a correct opinion."

Added to this often occur a high fever and well-marked umbilication. To distinguish this from small-pox we must rely upon the history of the disease and the presence of other signs of syphilis and the constitutional symptoms. In most cases of syphilitic eruption there are flat, copper-colored, scaly papules along with the vesicles, and the rapid changes which occur in the small-pox lesions are not present in syphilis. The temperature as a rule does not drop with the outbreak of the eruption.

Impetigo.—During the recent epidemic, many cases of impetigo were reported to our local health board. In some cases the diagnosis was made with difficulty, inasmuch as many of the small-pox cases assumed a bullous form of eruption.

The constitutional symptoms of small-pox are lacking, there is but little surrounding infiltration, the lesions rising abruptly from the surface much as in the blebs of pemphigus.

In impetigo contagiosa the lesions rarely exist in numbers, have more crusting than in small-pox, and the constitutional disturbance is slight.

While Acne should present no difficulty of diagnosis from small-pox, the writer desires to report a case where an error was made by attempting to make a snap diagnosis.

In January last, a man walked into the New Bedford Board of Health office stating that he had small-pox, and desired to be sent to the hospital. He added to this unusual statement that he had had small-pox twice before, once ten years and once six years previously. As an immune he had been nursing small-pox for the last month in a neighboring city, and left there two days before, and had come to New Bedford for employment. He gave no history of backache, fever, or headache, but said for the last few days he had not felt well and knew he had the small-pox, pointing to his face as evidence. On the face were several characteristic lesions of acne, and in addition four small papules, two upon the

forehead and two upon the cheek. These papules were not indurated. There was nothing else upon the body. There was nothing upon the mucous membrane of the throat. The temperature was 98.2. Taking into consideration the man's statement of having had small-pox on two previous occasions, the absence of constitutional symptoms and the presence of acne, the writer considering he had to do with one of those persons who whenever he has been exposed to a disease thinks he has contracted it, flatly refused the man's request to be transferred. His address was, however, taken, and two days later the man was found sick with small-pox which proved to be of average intensity. The eruption when seen must have been only a few hours old.

In addition to the period of the prodromal rash already spoken of, measles are sometimes mistaken for small-pox; the lesions in measles differ from the early papules of small-pox in their lack of induration, their remaining papular, and their method of spreading, as they have a tendency to occur together and to arrange themselves in corymbic groups with alternating paler spaces.

In certain cases the diagnosis between hæmorrhagic measles and hæmorrhagic small-pox cannot be made at once.

These with certain drug eruptions, arising from iodide of potassium, copaiba, etc., comprise about all the diseases that can be confounded with small-pox, except one, and that is varicella which often presents many difficulties. Hebra and Kaposi always maintained that the two diseases were identical, but although this is not sustained by authorities in general, it only proves that in many epidemics there is great similarity between them. Let us for a moment consider the pathology of the two diseases.

In small-pox the lesion is in the stratum mucosum, the localized œdema giving the characteristic shot-like hardness to the papule, and then as the vesicle is formed the cell-remnants are pushed together, forming many septa, dividing

the vesicles into pockets and forming the so-called multilocular vesicle which at a certain stage cannot be completely emptied by a single pin-prick.

In varicella the lesion is superficial, the delicate septa even if formed at all are rapidly destroyed, and the vesicle is unilocular and can be completely emptied.

Notice should be taken first of the prodromal symptoms usually slight in chicken-pox and of more significance in small-pox, the sudden drop of the temperature to normal in the latter simultaneous with the outbreak of the eruption, while in varicella the temperature is not increased until the rash appears and then usually rises one or more degrees.

The location of the rash—on the skin in varicella, under the skin in small-pox, soft in one, indurated in the other, rapidly developing in the former into vesicles, passing more slowly through the macular, papular, into the vesicular stage in the latter. In varicella the eruption often comes out in successive crops in the same region, while in small-pox there is uniformity of appearance, that is, papules, vesicles and pustules not being present at one time in the same locality. In small-pox the eruption appears almost always first upon the face, in varicella more often the trunk or chest. Umbilication is usually present at some stage in small-pox, in chicken-pox if present is limited to a minute area at the top of the vesicle.

Such in brief are the differential points. Corlett, in his excellent work on "Acute infectious exanthemata," from whose plates and text the writer has received much aid, says: "During the early part of an epidemic or in sporadic cases there are few physicians who may not be thrown off their guard and fail to recognize a mild form of variola. Especially is this the case when mild initial symptoms are followed by an eruptive stage in which but two or three lesions are present or when the eruption, likewise following the mild initial stage, goes through the various stages of de-

velopment in quick succession, the whole process being complete within ten days or a fortnight."

As we learn more from errors than from correct diagnosis, two cases may be of interest.

In the epidemic in Bristol County among the French-Canadians in 1900, the eruption took on a peculiar form. The first case reported in New Bedford was in a man who had been sick for about a week, who had called in no physician. He was found with a bullous eruption practically covering the whole body. Two children in the family were playing in the adjoining garden covered with superficial crusts. They had been a little "feverish" about two weeks before, and their mother said they had spots like the father. It seemed as if the children had had varicella, and as if the father was having small-pox. The services of a gentleman from out of town well-posted in contagious diseases were secured, and he diagnosed this case as well as others which developed in the neighborhood, as chicken-pox, for the following reasons,—1st, the large size of the vesico-pustules, many being the size of a two-cent piece or even larger. 2d, the absence of marked induration around them. 3d, the contents being sero-purulent rather than purulent. 4th, the utter collapse of the lesion on a pin-prick, showing them to be at this stage unilocular; and lastly the very mild constitutional symptoms present when the eruption was so universal.

This proved afterwards to be the usual form taken by the disease during this epidemic, and was true small-pox in a modified form. Out of 175 cases at this time, nearly all unvaccinated, there were only three deaths, and yet it was a common sight to find in many cases the eruption so universal and thickly scattered that there was scarcely an area of unaffected skin large enough to put the finger-tip upon. It seemed to the writer that the reason of the vesicle being unilocular was that in these cases the evolution from papule

to vesicle, and again to vesico-pustule, was so rapid that the usual septa did not have time to form, or if they did were so weak that they became almost immediately destroyed.

The writer was called in recently to see a case of a girl aged ten who had had an eruption for ten days. Her mother said the child had been vaccinated twice within the previous twelve months, though unsuccessfully. This was probably true, as the public schools demand such vaccination. About ten days before, the child had not felt well for a day or so, and had an eruption of little "blotches" as the mother expressed it. These had dried up, and there remained at the time of my visit a number of flat lesions about the size of a pea well distributed over the body, no one area especially being involved, and covered with slight scaling. There had been no small-pox in this section of the city for over a year, and no chance of contagion which could be traced. No one else in the family was affected. Taking into consideration the history of the case as far as could be ascertained, the writer diagnosed the case as one of probable chicken-pox, and diagnosed it chiefly on the lack of induration of the fast-fading lesions. A fellow-practitioner who has had considerable experience with small-pox saw the case independently on the same day, and decided the disease had been chicken-pox, and based his diagnosis on the total lack of induration. Ten days later we were called to the same house, found two children with slight papular rash and a third with a well-defined case of small-pox. It is such a case as this that shows the importance of following up closely all cases where there may arise even suspicion that small-pox may have been present.

In conclusion, it has been a source of comfort to the writer, and may be to some of his fellow-practitioners, to read Osler's words on small-pox, printed in his edition of 1901. He says: "There may be epidemics, so mild in character that it must be confessed that the recognition of the nature of the

outbreak is sometimes only confirmed by the appearance of a genuine case of the confluent or of the hæmorrhagic form."

DISCUSSION.

Dr. A. N. Broughton, of Jamaica Plain: There is one thing which has been emphasized as characteristic of small-pox about which I am in doubt. It has been stated that in any given area all the lesions are of the same type. For example, if on the forehead there is a papular eruption, they are all papules, and no pustules. In a case which I saw a few weeks ago, the patient had a temperature of 103, and a universal eruption which would make a perfect picture of syphilis. This eruption in the mouth as well as in the body was entirely papular, with the exception of two distinct vesicles on the forehead and these appeared to me to be umbilicated. On the following morning I saw the case with an officer of the Board of Health, who thought it was probably not variola, especially as there were several vesicles on the abdomen, back and forehead, and yet, everywhere else were still papules. That afternoon Dr. Shea sent him to the hospital as a case of variola. I would like to ask Dr. McCollom if that statement is correct,—that the lesions in a given area are all uniform?

Dr. J. H. McCollom: In reply to Dr. Broughton's question, I will say that sometimes we do see on the abdomen, or in the inguinal region, or in the axilla, a pustular eruption, when the rest of the eruption is vesicular. There is a great difference between modified small-pox and the unmodified variety.

Dr. T. B. Shea, of Roxbury: I think something might be said in regard to varicella. Dr. Bullard said that this is a disease occurring essentially in children. During the past week I have seen several cases of varicella in adults. The text-books pass this disease over very lightly by saying that it is a disease of childhood. Varicella is not a light thing in adults. The history looks a good deal like small-pox.

The eruption does not appear for twelve or fourteen hours, and sometimes it commences on the forehead as does small-pox. Now, as to the question of the eruption of small-pox in the beginning always being found on the face. That statement is not borne out by the experience we have had this past winter. I have seen about 1300 cases since last August. In the early cases, I usually look for the eruption on the abdomen. Also, another place where the eruption may be seen very early,—on the arch of the foot. You will often find a few papules occurring there before they occur on the face. No matter how the disease has been modified by vaccination, I think something will always be found there.

ARTICLE IX.

LEGISLATION WITH REFERENCE TO SMALL-POX AND VACCINATION.

By SAMUEL W. ABBOTT, M.D.

OF NEWTON CENTRE.

For more than thirty centuries the necessity of requiring mankind, by means of legal enactments, to observe certain rules of health, has been recognized by every civilized government.

"This necessity has found expression in those statutes which have had for their object the prevention of disease, and the result has been that those people who have most carefully protected themselves by strict legislation, and who have most rigidly enforced the observance of health laws, have enjoyed the greatest immunity from the ravages of plagues and pestilence; while a neglect of proper precautionary measures has usually resulted in periodical decimation of the population by the scourge of communicable disease."*

The foregoing extract forms a fitting introductory to the observations which I shall present, relating to the subject of legislation in its relation to small-pox and vaccination. Froude says of legislation in general: "Our human laws are but the copies, more or less imperfect, of the eternal laws, so far as we can read them, and either succeed or

* Parker and Worthington. The Law of Public Health and Safety.

promote our welfare, or fail, and bring confusion and disorder, according as the legislator's insight has detected the true principle, or has been distorted by ignorance and selfishness."

In the early history of the Province of Massachusetts, small-pox was the one disease which caused, among the people, the greatest degree of anxiety and alarm. Notwithstanding the sparsely settled condition of the population, its appearance was frequent, spasmodic and alarming. It had a way of swooping down upon the population like a destroying angel at frequent intervals, attacking nearly every man, woman and child who did not already bear upon their own bodies the scars of a previous epidemic.

In 1721, 6006 persons in Boston were ill with small-pox, or more than half the entire population, and 850 of these died. In 1792, 8346 had the disease. In this latter epidemic, it is stated that, out of a population of 19,484, 10,655 had already had small-pox, and that only 221 persons escaped having the disease, the remainder having moved out of town.*

So virulent did it at times become as to compel the Legislature to hold its sessions in some other town.†

There can be little wonder, then, that legislatures should have sought relief from this unfortunate condition by enacting such legislation as seemed necessary for the protection of the people. Many of the statutes of Massachusetts, now in existence, bearing upon this subject, date from 1701, 1776, 1792 and 1797, and are the outcome of serious epidemics. Then came the fortunate discovery of vaccination, with further legislation of 1809, and later enactments upon this same subject.

Let us now briefly review the existing legislation of Massachusetts and see what has been accomplished for the

* Report of State Sanitary Commission of 1850, p. 70.

† Report of State Sanitary Commission of 1850, p. 64. See also Stone's Life of Sir William Johnson, Vol. 1.

protection of the community. How does this legislation affect the management of epidemics of small-pox?

I shall treat the subject under two general heads: Laws relating to Small-pox, and Laws relating to Vaccination.

SMALL-POX.

1. NOTIFICATION.—First, and most important, is the law requiring the attending physician to give notice of a case occurring in his practice ("a person whom he is called to visit") *immediately*, to the local Board of Health. (Revised Laws, Chap. 75, §50.) This notice must be "in writing, over his own signature"—a mere verbal statement, delivered upon the sidewalk, or over his carriage-wheel, is not sufficient in the eye of the law. It may be urged that the young and inexperienced physician, sometimes also older and more experienced men, may not be able at the first, or even at a later visit, to distinguish between small-pox and some other disease; for example, chicken-pox or measles. In such cases, where there is even a suspicion of small-pox, it is best to give the community the benefit of the doubt, and to call in an expert who has had a large experience in the diagnosis of small-pox. During epidemic prevalence of small-pox, as at the present time, the presumption in each doubtful case (of its being small-pox) is greater than at other times. The English Notification Law differs from most American statutes upon the subject, in allowing the general practitioner a fee of 2s. 6d. for each legal notice of a case of infectious disease.

2. The same duty of notification is also incumbent upon the householder (Revised Laws, Chap. 75, §49), but, except in flagrant cases, it has not been the custom to enforce this law to the same extent as the former, chiefly from the fact that laymen cannot be expected to be as familiar with diagnosis as the trained physician. In all cases, however, of wilful concealment, when there can be no doubt as to

the knowledge of the householder, it would seem proper to take legal action.

3. The local Board of Health is also required to give "*immediate* information of each case to the School Committee." (Rev. Laws, Chap. 75, §51.)

4. When the local board is informed of the existence of a case of small-pox, it must also, "*within 24 hours*, give notice of the same to the State Board of Health." Chap. 75, §52.

5. The State Board of Health must then "*forthwith* transmit a copy of the foregoing notice of the local board to the State Board of Charity." Chap. 75, §52.

Here, then, are five separate kinds of notice required by law in each case of small-pox.

(1) By the physician to the local Board of Health.
(2) By the householder to the local Board of Health.
(3) By the local Board of Health to the local School Committee.
(4) By the local Board of Health to the State Board of Health.
(5) By the State Board of Health to the State Board of Charity.

The first four are sanitary measures intended for the protection of the public health, and the fifth is for the protection of the public treasury.

Each of these forms of notice applies with equal force to other dangerous diseases as well as to small-pox.*

What is the next provision of the law, the case having been properly notified?

6. If circumstances require it, the patient may be re-

* The English law has a certain degree of elasticity by allowing local option, by which a district may include, for the purposes of notification, certain other infectious diseases of minor importance not embraced in the general act, such, for example, as measles and whooping-cough.

The German law (1893) requires notification of cases and deaths of Asiatic cholera, typhus, yellow fever, plague and small-pox, and of cases only of typhoid fever, diphtheria, croup, recurrent fever, dysentery and scarlet fever. (Hime, Practical Guide to the Public Health Acts, 1901, p. 156.)

moved from his dwelling by the board of health "within the limits of the town." (Revised Laws, Chap. 75, §86.)

7. The board of health is required "to provide a hospital or place of reception, and such nurses and other assistance and necessaries, as is judged best for his accommodation and for the safety of the inhabitants." (R. L., Chap. 75, §42.)

If the patient lives in a spacious house, with large apartments, and especially if the house is in an isolated position, there can be no objection to his being treated in his own dwelling, provided that the health of the community is not likely to be endangered thereby. In a densely settled locality, and in small and crowded tenements, however, the public safety demands removal to a hospital.

It is quite plain moreover, that such conveyances should be used and such precaution taken in the removal as shall also least endanger the community.

The following decisions will be found useful for reference in connection with this law:

Springfield v. Worcester, 2 Cushing 52,
Spring v. Hyde Park, 137 Mass., 554,
Brown v. Murdock, 140 Mass., 314,
Hersey v. Chapin, 162 Mass., 176.

The following rules for the guidance of local boards of health in dealing with cases of disease dangerous to the public health may be deduced from the foregoing decisions:—

In case it is desired to isolate the sick person, he should be removed to a hospital to be provided by the board, except in the case where he cannot be so removed without danger to his health.

Even where the condition of the sick person is such that he cannot be removed without danger to his health, the board has no authority to establish the place where the sick person is as a hospital, without the consent of the owner thereof.

In case the board desires to provide a hospital to which to remove such cases or to establish as a hospital the place where the sick person is, and is unable to hire the building for that purpose, it should procure the issuance of a warrant under Sect. 46. R. L. Chap. 75.

8. By an old law there is also provision for the retention

of the patient where he is, "if he cannot be removed without danger to his health," and the "persons in the neighborhood" may be removed. (Revised Laws, Chap. 75, §42.)

9. In addition to the foregoing provisions of the statutes, there are still remaining a half-dozen sections relating to small-pox enacted in 1797, providing methods of a more or less clumsy character for removing sick persons, securing infected articles, impressing men to act as guards, &c. The unusual safe-guards contained in these Laws are provided in order that private property may not be appropriated to public uses without the consent of the owner, except by due process of law prescribed by the statutes.

10. When a dangerous disease "exists in a town" it becomes the duty of the board of health to "use all possible care to prevent the spreading of the infection, and to give public notice of infected places to travellers by displaying red flags at proper distances, and by all other means which in their judgment shall be most effectual for the common safety."—(Rev. Laws, c. 75, §43.) This latter clause is sufficiently broad and liberal in its terms to allow all reasonable methods to be employed which the circumstances of each individual case may require. A penalty makes it possible to enforce this law against any one who wilfully interferes with its operation.

11. Hospitals.—Several provisions now exist in the statutes of Massachusetts for the establishment of hospitals either temporary or permanent, for the reception of persons ill with small-pox. The emergency has arisen more urgently in the present epidemic, than ever before, in consequence of the increasing density of the population. These laws date from a period as early as 1701, when towns were authorized to establish and keep themselves constantly provided with such hospitals "subject to the regulations and orders of the board of health." (R. L., Chap. 75, §35.) A law of 1764, providing that "no such hospital shall be established within

100 rods of an inhabited dwelling house, situated in an adjoining town, without the consent of such town" (R. L. c. 75, §37), if strictly applied at the present day, would in certain densely settled cities of small area, prove a hardship, since it would limit the position of the hospital to a very small space in the centre and populous portions of such city.

By an act of 1870, the use of a building as a hospital may be prevented by a penalty, if "prohibited by the mayor and aldermen or selectmen." (Rev. Laws, c. 75, §38.)

A hospital of this character, once being established, "the physician, nurses, attendants, the persons sick therein, and all persons approaching, or coming within the limits thereof, and all furniture, and other articles used or brought there, must be subject to such regulations as may be made by the board of health."—(R. L., c. 75, §36.)

By a law enacted last year (Chap. 171 of the Acts of 1901) it was provided that "Every city in the Commonwealth shall establish within its limits, and keep itself constantly provided with one or more isolation hospitals for the reception of persons having small-pox, or any other disease dangerous to the public health." Such hospitals are to be subject to the orders and regulations of the Board of Health. (R. L., c. 75, §40.)

By further provision the city is liable to a penalty of $500, if it refuses to provide such a hospital "after having been requested so to do by the State Board of Health"—(c. 75, §40). There are in Massachusetts at the present time about fifty cities and towns, each having over 10,000 inhabitants. By a report of the State Board of Health of 1899, it appears that about half of these places only had any provisions whatever for the reception of persons ill with small-pox, and of these several were merely old-time "pest-houses" so-called, which were inadequate to fulfil the demands of an epidemic of such proportions as the past season has witnessed. This epidemic has stimulated a few more

cities to make provisions of this character, but there are still several cities and large towns which are entirely unprovided for such an emergency. The principle of waiting for an epidemic before taking action, is too much like that of waiting till a great conflagration has burned up several houses, before adequate fire apparatus is purchased by a city or town.

In the case of several of the crowded cities and towns of the metropolitan district, having a very small area, an arrangement could be made, such as is permitted in English towns, whereby two or three small contiguous cities or towns might unite in erecting and maintaining a hospital to be used in common by such municipalities.

12. The only statute in Massachusetts having reference to the treatment of the body of a person who has died of small-pox is that which forbids the transportation of such bodies by railway corporations or others, until these bodies have been "so encased, and prepared, as to preclude any danger of communicating the disease to others, by its transportation."—(R. L., Chap. 78, §43.)

Stringent laws relating to the methods of conducting funerals and to the transportation of dead bodies or persons who have died of infectious diseases, exist in some States. I am inclined, however, to agree with Dr. Chapin,* who says, "the danger to be apprehended from such bodies has been much exaggerated." Such a body, however, having once been placed in its casket or coffin and the lid closed, the coffin should not again be opened for any purpose.

The real danger in public funerals is not so much the corpse lying still in its casket, as the lingering infection transmitted by the living person to the rooms which he has occupied before his death. As a "living dog is better than a dead lion," so one live man, sick with an infectious disease, living and breathing and reproducing the *materies morbi* of such disease is, under ordinary circumstances, a

* Municipal Hygiene, p. 470.

far greater danger to the community than the dead body of one who has died of the same disease.

The following notes relating to Court decisions upon the foregoing topics may be found useful. While some of them relate to laws of other States, many of these laws have been copied from Massachusetts laws, and are of similar character and phraseology.

Indigent sick persons, suffering from infectious diseases, may be sent to a public or private hospital to be treated at the public expense.

State v. New Orleans, 27 La. Ann. 521.
Tucker v. City of Virginia, 4 Nev. 20.

A person sick with an infectious disease in his own house, or in suitable apartments at a hotel or boarding-house, cannot be removed without his consent, under the authority conferred by a city charter "to abate and remove nuisances."

Brown v. Utica, 2 Barb. 104.

For further decisions relative to taking possession of houses and furniture without consent of owner, for use as a hospital, &c., see,

Spring v. Hyde Park, 137 Mass. 554.
Brown v. Murdock, 140 Mass. 314.
Lynde v. Rockland, 66 Maine, 309.

Health authorities can decide on propriety of removal,

Haverty v. Bass, 66 Maine, 71.

"In order to carry out the law relating to the isolation of persons suffering with small-pox, and for the protection of the community, it may become necessary to convert private houses into hospitals and make them subject to hospital regulations, to seize and destroy infected articles, and to do many other things, which under ordinary circumstances would be considered a gross outrage upon the rights of persons and property. This is allowed, on the same principle

that houses are allowed to be torn down to stop a conflagration. *Salus populi est suprema lex*, is the governing law in such cases. When the public health and human life are concerned, the law requires the highest degree of care. It will not allow of experiments to see if a less degree of care will not answer." (Parker & Worthington, p. 134.)

Seavey v. Preble, 64 Maine, 120.
Labrie v. Manchester, 59 N. H. 120.
Farmington v. Jones, 36 N. H. 271.
Kennebunk v. Inhabitants of Alfred, 19 Me. 221.

"Notwithstanding this privilege, it does not appear that a house may be seized and occupied against the will of the owner. The consent of the owner must be obtained to the use and appropriation of his property by the board of health, and provision made for his compensation, by means of a regular contract. Otherwise the property must be appropriated to the use of the board of health by proceedings regularly had for its impressment to the public use, as is provided for in the statutes of several States, accompanied by suitable safeguards in each case."

Lynde v. Rockland, 66 Maine, 309.
Spring v. Hyde Park, 137 Mass. 554.

In the matter of disinfection after small-pox the law of this State (Rev. Laws, Chap. 75, §49) states, "Upon the death, recovery or removal of such person, such of the rooms of said house, and such of the articles therein, as, in the opinion of the board of health, have been subjected to infection or contagion, shall be disinfected by the householder, to the satisfaction of the board of health."

Practically this work is done by the board of health, but strict compliance with the law would at least in all such instances make it advisable to give the owner timely notice that such rooms and articles are to be disinfected within a certain time, and if the owner fails to comply within the specified time, the board is fully justified in doing the work at the householder's expense. (Parker & Worthington, p. 139.)

VACCINATION.

In nearly all States, as well as in civilized countries generally, laws exist providing for the vaccination of the population, and particularly for that portion which attends the public schools.

Abeel v. Clark, 84 Cal. 226.

This requirement, of submission to vaccination, is a constitutional exercise of the police power of the State, which can be sustained as a precautionary measure in the interest of the public health. (Parker & Worthington, p. 139.)

The Massachusetts Laws relating to vaccination require—

1. "A parent or guardian who neglects to cause his child or ward to be vaccinated before the child or ward attains the age of two years, except as provided in R. L., Chap. 75, Section 139, shall forfeit $5 for every year during which such neglect continues."

2. By an act of 1855, the local Board of Health must "require and enforce the vaccination and revaccination of all the inhabitants," if, in the opinion of the board, it is necessary for the public health and safety. Every person over 21 years old, not under guardianship, who refuses or neglects to comply with this requirement is liable to a penalty. (Chap. 75, §137.)

The chief defect in this law, as also in the laws of other states, is that it recognizes a false principle in sanitation. The ideal community, so far as vaccination is concerned, is not that population in which "the public health and safety" requires vaccination at irregular times and seasons, on the eve of, or in the midst of great epidemics, but a community in which vaccination and revaccination are constantly and uniformly practised year by year upon all young children and upon older children at the end of a definite period, say, of 10 or 12 years. In such a community there are no epidemics of small-pox, because there is no virgin soil in which it can take root and flourish.

A law, then, which only requires vaccination when small-pox is prevailing or is epidemic in the State or district, is defective, and wrong in principle, and a community living under such conditions and with such laws, may, as I have already said, be likened to one which waits for a great fire before purchasing its fire apparatus. The only correct sanitary principle in regard to vaccination is that of complete and permanent immunity, and not that of partial and temporary immunity of the people.

3. By a further provision of the same law (Chap. 75, Revised Laws, §137), as amended in 1894, the local Board of Health is required "to provide the inhabitants with free vaccination," if, "in the opinion of said board," the public safety requires it. Here, again, the law, unfortunately, recognizes a wrong principle of waiting until "in the opinion" of a local board of health "the public safety requires" vaccination. As an illustration of the defective character of this principle during the present epidemic, several instances have occurred in which local boards of health have, unfortunately, been composed (at least partially) of men who were opposed to vaccination. In several instances, the presence of one anti-vaccinationist upon a local board of health has so influenced the action of the board as to result in serious harm to the community, by delaying public vaccination, until the common sense of the community compelled them to act.

Possibly, the framers of such laws recognized this defect, but also recognized the common but often fallacious principle of local self-government, which allows those municipalities which do not act for the common safety of their population, to suffer the consequences of such neglect. But, unfortunately, small-pox is a contagious disease, and is not confined to the boundary lines of cities or towns. The neglect of one town or one State may prove also a serious menace to the people of another town or State. Again,

the non-voting part of the community, the women and especially the unprotected children, may become the victims of the neglect of the voting portion.

4. For many years a beneficent law existed in this State as well as in many others, providing that the School Committee "shall not allow a child who has not been duly vaccinated to be admitted to or connected with the public schools." The law was absolute, and wherever this provision has existed and has been thoroughly enforced, it has proved to be a helpful aid in protecting the community. But, unfortunately, in consequence of unwise opposition, this law was so amended in 1894, as to admit to school any child who was, in the opinion of a "regular practising physician," "an unfit subject for vaccination" (R. L., Chap. 75, §139). The intent of this law was to admit such children as might be temporarily unfit for vaccination, in consequence of some ailment which might possibly make it improper to vaccinate the child for the time being. The serious blunder of enacting such a statute has been illustrated in the experience of the present epidemic, wherein it has appeared that the law has been frequently misapplied, by using it as a means of exemption for *any* child, without regard to its condition of health, on the ground that the certifying physician believed that all children were unfit subjects for vaccination. Worse than this, such certificates became for a time the subject of further abuse, since physicians advertised that they would, for a small fee, send certificates by mail to parties at a distance, without personal examination of the child. This mode of abuse has now been corrected by a law of this year, requiring that the certifying physician "at the time of giving the certificate, shall have personally examined the child, and that he is of the opinion that its physical condition is such that its health will be endangered by vaccination." This exemption is in force, according to the statutes, "while such condition con-

tinues." The law is still defective, since it still allows a physician to apply it to any child whom he may consider an unfit subject, and may hence apply it to all children, if he happens to be an opponent of vaccination in general. To remedy this defect, the local board of health, through its medical officer, should have discretionary power to revise the certificate upon similar personal examination.

The direct consequences of this unwise legislation are seen in the present epidemic, wherein it appears that during the twelve months ended Dec. 31, 1901, 64 unvaccinated school children, between the ages of five and fifteen years, had been attacked with small-pox. The records of 1902 have not yet been tabulated, since the year is now but half completed. But an examination of all the records for the past 14 years show that during that time 389 children under 15 years of age had been attacked with small-pox, of whom 66 were vaccinated and 323 were unvaccinated. The most significant fact, however, in regard to these 389 cases is, that out of the 66 vaccinated children there were *no* deaths and among the 323 unvaccinated children there were 37 deaths, or 11.4% of the whole.

5. Another statute requires that the "inmates" of all incorporated manufacturing companies, and those of public institutions, shall be vaccinated when the local board of health requires it. (R. L., c. 75, §138.) As a general rule, the superintendents of public institutions are careful to keep their inmates vaccinated, and, as a consequence, but few cases of small-pox have occurred among them during the present epidemic. Such, however, is not the invariable rule with manufacturing corporations. In several small manufacturing villages in the State, through neglect of this precaution, serious outbreaks have occurred.

The superintendents of the paper-mills in Holyoke and in other western towns of the State, where paper is largely made, have been careful in requiring their employés to be

vaccinated, so that the serious outbreaks among such persons which once prevailed in consequence of the handling of infected rags, have, in this epidemic, been notably absent.

In the brief summary which I have here presented, I have only touched upon some of the most important points in the legislation relative to small-pox and vaccination. Other and important questions of a legal character have arisen and may continue to arise in the future. Two points, however, are very clear:—

First. The necessity of sufficient laws in all countries, relative to infectious disease prevention.

Second. The necessity of careful enforcement of such laws. We may choose between two courses. By fulfilling these two conditions: Law,* and its enforcement, the State may be rid of small-pox, with the exception of such single cases as may be imported. On the other hand, in the absence of law, or if existing and not enforced, small-pox will run riot at intervals among the people.

In illustration of this point, I will call your attention to the condition of two countries which afford examples of careful study:—

In England, vaccination laws have existed for nearly a century, but these laws are defective and limited in character, the force of the legislation having been expended upon primary vaccination, to the serious neglect of revaccination. Added to this, opposition to vaccination has been more vigorously agitated there than in any other country in the world. So great was this opposition, that a Parliamentary Commission spent nearly eight years in considering the subject, and published a report of several thousand pages, the final result of which was the enactment of a blundering amendment, usually known as the "Conscientious Objector" Act, the weakness of which was shown upon the first

*By the term Law here, an adequate law requiring the vaccination and revaccination of the entire population above a certain age is intended.

occasion of a trial at court under this law. (See Hime's Practical Guide to the Public Health Acts, Appendix, p. 53.)

As a consequence of the opposition prevailing in England, the exemptions from vaccination existing in different cities among children subject to vaccination, have varied from as low as 3.8% in Liverpool and 6.4% in Manchester, to 79.9% in Leicester and 23.9% in London, in recent years; and what is the result of this wholesale neglect? Small-pox is prevailing in London this year to a greater extent than at any time since the serious outbreak of 1871-'72. From the first of last January until now, the new cases of small-pox reported in London have averaged over 300 per week.

Contrast with this the splendid condition of Germany to-day. That country, with its fifty millions of population, may be likened to a city surrounded with a solid and impenetrable rampart or wall, and a picket-line of well-drilled soldiers outside of the wall. This wall and picket-line are the well-enforced vaccination laws of the country. The men, women and children are the well-protected army of soldiers. Small-pox may occasionally break through the outer picket-line in the shape of some wretched, unvaccinated immigrant from Russia, Austria, Italy, France, or Belgium, but the great mass of the well-protected population inside the fortification suffers no damage. This condition was effected by the enactment of a law in 1874 providing for the vaccination of every infant and every pupil in the schools at definite ages. As might be expected, with the existence of such a law, small-pox would gradually become extinct. In the first year, only a small part of the population would be vaccinated (1, Primaries, *i. e.* children under 2 years of age, and, 2, Revaccinations, or children in their twelfth year); but the work of each succeeding year would add proportionally to the vaccinated popu-

RECORD OF VACCINATION.

To be filled on the day of Vaccination.

1	2	3	4	5	6	7	8	9
Number.	Date of Vaccination.	Name of Vaccinated Person.	In case of Re-vaccination at ages over ten years, of persons previously successfully vaccinated, mark R.	Age. Yrs. Mos.	Residence. (Street and Number.)	Source of Lymph. Name of Producer.	Number of separate scarified areas or punctures made.	Initials of Vaccinator.
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

RECORD OF VACCINATION.

To be filled on the day of Inspection.

10	11		12	13	14	
Date of Inspection.	Result. Successful number of separate vesicles produced.	Result. Unsuccessful.	Initials of Inspector.	Certificate of School Vaccination given. Yes.	No.	REMARKS.

1
2
3
4
5
6
7
8
9
10

lation. This has been the result, and at the present day no cases of small-pox occur in that country which are not imported from neighboring lands, outside the limits of Germany. Such might be the case with any State or nation which adopts a similar course; and if all countries were to adopt it, small-pox would become a thing of the past. It is sometimes argued that small-pox is a filth disease, and only prevails among filthy people. But Paris and Vienna are as clean as Berlin, and yet these cities are very often visited by small-pox, while Berlin has none.

In one important point, our own laws as well as those of most American States are defective, and that is in the absence of any definite provision requiring a record of vaccination to be made, at least, in the case of all vaccinations performed under public authority. Boards of health often make wholesale vaccinations upon the population of large districts, institutions, schools, the employes of corporations, etc., without even a slight record of the names only of those who have been vaccinated. The laws, or at least the regulations of other countries are very explicit in this matter and require not only a record of the date, name, age and sex of each person vaccinated, but also a record of the result of the subsequent inspection, which should always be made at the end of about a week. Such a record is often of very great value in settling disputed cases. To meet this objection, the State Board of Health has furnished to every local board in the State, suitable record-books for this purpose. These books are modelled upon the forms supplied by the Local Government Board of England to the public vaccinators.

Herewith is a copy of a single sheet, each of which gives opportunity for recording 10 vaccinations and each book for 1000 or 2000, according to size of the book.

In this paper I have purposely avoided allusion to those vexing questions relating to the economic side of this question which invariably arise in every epidemic of small-pox.

I have omitted discussion of this phase of the subject, both for want of time, and because the valuable time of a scientific body can be better employed than by the discussion of financial matters which can quite as well be submitted to the lay members of boards of health.

Those health officers, however, who desire to consult the various statutes and decisions relating to the expenses of caring for small-pox patients, the salaries of attending physicians, nurses, attendants, liability for destruction and injury of houses, furniture, bedding, etc., etc., may find abundant reference in the legal works upon the subject. See Parker and Worthington, Law of Public Health and Safety; and the following Supreme Court Decisions:

Spring v. Hyde Park, Mass., 137. 554.
Brown v. Murdock, 140 Mass., 314.
Orono v. Peavey, 66 Me., 60.
Hampden v. Newburgh, 67 Me., 370.
Farnsworth v. Kalkaska Co., 56 Mich., 640.
Rae v. Flint, 51 Mich., 526.
Wilkinson v. Long Rapids, 74 Mich., 63.
Clinton v. Clinton Co., 61 Iowa, 205.
Kellog v. St. George, 28 Me., 255.
Miller v. Somerset, 14 Mass., 396.
Mitchell v. Cornville, 12 Mass., 333.
Childs v. Phillips, 45 Me., 408.
Gill v. Appanoose Co., 68 Iowa, 20.
McIntire v. Pembroke, 53 N. H., 462.
Albany v. Wilkinson, 28 N. H., 9.
Fort Wayne v. Rosenthal, 75 Ind., 156.
Staples v. Plymouth Co., 62 Iowa, 364.
Elliott v. Supervisors, 58 Mich., 452.
People v. Macomb. Co., 3 Mich., 475.
Schmidt v. Stearns Co. 34 Minn., 112.
Labrie v. Manchester, 59 N. H., 120.
Farmington v. Jones, 36 N. H., 271.
Kennebunk v. Alfred, 19 Me., 221.

One of the unfortunate circumstances connected with sanitary legislation at the present day is the absence of medical men in the Legislature. On this account, Public Health Committees must necessarily be composed either wholly or

almost wholly of laymen. Medical questions are constantly arising at every session, and it is important that a committee which is called upon to discuss and present to the Legislature many medical and sanitary questions should have at least one medical member. Laymen do not appreciate the value of legislation intended for the prevention of disease so keenly as men who are trained for this special purpose. Hence it is important that this want should be supplied, in order that the efficiency of sanitary legislation may not be impaired.

DISCUSSION.

Dr. G. A. Miles, of Somerville: I would like to speak of one thing to which Dr. Abbott refers, and that is with reference to children getting into our schools unvaccinated, not only by certificates given by physicians, certifying that the child is an unfit subject to be vaccinated, but also those children who have been vaccinated, but no inspection of them afterward to see the effect. Since this outbreak in Somerville I have been surprised to find the number of children in school holding certificates of vaccination, although the operation was entirely unsuccessful. This has brought very forcibly to my mind the great importance of examining every case before a certificate is given, not only to see that the patient is protected, but also that it is being properly cared for and doing well.

Dr. S. H. Durgin, of Boston: I think for a physician to give a certificate before he knows that the vaccination has taken is both stupid and illegal, and it should be denounced from one end of the land to the other.

ARTICLE X.

SMALL-POX: ITS MEDICAL TREATMENT.

By MICHAEL KELLY, M.D.
OF FALL RIVER.

Small-Pox is a disease which affects the entire system. The physician's duties in regard to it are many and varied. Its treatment is necessarily expectant and symptomatic. A self-limited disease, running a definite and regular course, no plan of treatment will abort or modify it when once developed. Perhaps its present extensive spread, giving opportunities for its study by numerous observers using modern scientific methods of research, will soon disclose the nature of the contagium, and thus rob it, in those who through ignorance or misfortune have escaped vaccination, of its loathsomeness and terrors.

As soon as the diagnosis is made, if not as soon as a competent observer has a reasonable suspicion that a case is variola, the patient should be isolated. It would be well, of course, to have some suitable place of detention for cases that are only reasonably suspicious. For the treatment of those in whom the disease is diagnosed, an isolation hospital is the proper place, and there they should be sent at once.

The isolation hospital, where patients are to be confined from two to three weeks in mild cases, and from four to five weeks or more in severe cases, should be in construction

and equipment thoroughly on a par with the times. It should be a retreat in which the physician himself would elect to be confined, or to which he would willingly send members of his family or his friends if necessary. Small-pox patients are not criminals nor outcasts, and should not be treated as such; they are truly to-day either the victims of unfortunate circumstances or of their own invincible ignorance; and in submitting to the quarantine lawfully imposed by the Boards of Health they are making a sacrifice of their feelings at least for the public good. They should have all the comforts which their unfortunate condition demands.

As these patients cannot have the physicians of their choice but only those selected by the city or State, the physicians so selected should be men about whose qualifications there can be no reasonable doubt—men willing to prescribe, superintend or nurse as occasion demands—men who will inspire assistants and subordinates to discharge their duties with incessant vigilance. The disease, besides being a danger and annoyance to the patient, is a source of greater danger, embarrassment and expense to the community, and the physician entrusted with the mananagement of it should be fully able to sustain his combined grave responsibilities to patient and public.

Strong, ambitious, trained nurses, recently vaccinated and not afraid of the disease, should be secured when possible. There is considerable lifting, changing of position in bed, daily changing of bed clothing and bathing to be done for these patients, which would soon prove too much for delicate or timid nurses. The urgent need of keeping severe cases under unremitting observation, and the fact that death may occur suddenly at any time during the disease, even in cases apparently doing well, should be plainly taught the nurses from the start. Male nurses, when available, are better for men.

Physicians, nurses and all persons who may come in slightest contact with patients or their belongings, should be vaccinated, without regard to the time of previous vaccination, before beginning the discharge of their duties.

I believe it is within the province of this paper to say a word about prophylaxis. After the experience of a century we can declare without any hesitation that the head and front of the prophylaxis is vaccination. The disease would soon cease to exist if vaccination were universally practised.

An experience in managing an outbreak of the disease in Fall River, in 1899, proved conclusively a truth which theretofore I had accepted on the authority of teachers and text-books. Of a family of fourteen persons under my care two did not contract the disease, and these two were the only members vaccinated. These two always mingled freely with the family, and were sent to the hospital for isolation only. In all the families, nineteen in number, were members who escaped the disease, and these were invariably persons previously vaccinated. An old lady fifty-five years of age, the last of a family of six to yield to the disease, had been vaccinated, one cicatrix only, thirty years before. Though in very feeble health, for which she was under a physician's care, she developed only a fairly severe varioloid, and made a rapid recovery. Two, who were vaccinated ten years previously, each showing only one shadowy cicatrix, had well-marked varioloid but were not seriously ill at any time. None of my cases of varioloid, vaccinated at a nearer date than ten years before, manifested the disease in anything like a severe form. I have seen no case of varioloid in which there was more than one cicatrix from a previous vaccination. From the history of these cases, and others which I might mention, it is evident that vaccination properly performed and repeated at suitable intervals is the corner-stone of the prophylaxis.

Varioloid would neither be very annoying to the patient,

nor demand much attention from the physician, were it not for the position in which it places the patient in relation to the public. The fact that he who harbors varioloid is as apt to spread the disease in its worst form as he is who has variola vera, makes it as necessary to observe the strict laws of quarantine, disinfection and fumigation in the one case as in the other.

Only in rare cases do the subjects of varioloid require more than a day or two in bed. Owing to the effects of the preceding vaccination, remote though it may have been, as in the case just mentioned, in which it had been done thirty years previously, varioloid has no complications. After the the fourth or fifth day of the eruption, the low temperature which may have existed returns to normal, the vesicles or abortive pustules dessicate without progressing into fully matured lesions, or their contents become absorbed, leaving only broken shells. From this out the patients with this mild form of the disease are difficult to control; it is difficult at any time to convince them that they have a disease which is a menace to the public; it is hard to keep them quarantined until by efficient disinfection and fumigation the dangers of their spreading the disease have passed. The difficulties and uncertainties attached possibly or necessarily to the proper performance of the needed disinfection and fumigation in private houses point directly to the imperative need of treatment of even these mild cases in a hospital.

In discrete and confluent small-pox the indications for treatment are to preserve the patient's strength by every possible means from beginning to end, and to render the manifestations in the skin as little annoying as possible.

No special treatment is indicated for the incubation period except to prevent patients from doing anything which might debilitate them for the disease about to develop. I made attempts in two cases, however, to modify the oncoming disease at this stage. Two patients, a young man aged

twenty-two years and an infant of seven weeks, I vaccinated in what from the subsequent history proved to be the sixth and fourth days of this period respectively. Though the young man came down with the disease ten days later than a younger brother, both previously unvaccinated, he had the disease in a much milder form than his younger brother, and was discharged a week earlier. The infant developed a very abundant crop of discrete eruptions, had a high temperature, and skin very swollen and œdematous, and though the text-books inform us that it is the rule for children under one year with either discrete or confluent variola to die, this child was well at the end of twenty-one days, and had no pitting after five weeks. I will not say that these results were a consequence and not a coincidence of vaccination, or that the striking result in the case of the young man was not due to individual peculiarity of constitution. The cases are too few for a general conclusion. They are mentioned simply because they may assist in the discussion which is still *sub judice* of the benefits of vaccination in the incubation stage or at least in the early or middle period of that stage.

In the stage of invasion, occurring on the tenth to the fifteenth day of the incubation period, rest in bed is indicated. The rooms should have an abundance of pure fresh air. The absence of fresh air in the small, close rooms of tenement houses is more oppressive to these patients than it is to the subjects of typhoid fever or other febrile diseases. Twenty-five cases treated for a week in the eruptive period in tenement houses, and all then removed in one forenoon to a hospital where there was an abundance of fresh air of a suitable temperature, convinced the writer that fresh air is absolutely indispensable in keeping down the mortality. In these cases an imminent mortality of seven to ten per cent. was converted into no mortality at all. The temperature of the room should not be above 70 Fahr. nor much below 60 Fahr.

Solar light should be excluded as completely as possible, since it is reasonably certain that its access to the face is largely productive of the pitting left after severe cases. Inexpensive dark window curtains will serve this purpose. The headache, backache and other distressing symptoms following the rigor of this stage yield readily to four or five grains of phenacetine guarded by a little sherry wine or brandy, and repeated every two or three hours according to indications. The same formula, supplemented by moderate doses of the bromides and chloral, is useful for the fever and delirium accompanying the period of pustulation and suppuration. Gastric irritability is relieved by sucking small pieces of ice or by taking small sips of iced lemonade. Poultices or rubber bags filled with hot water applied to the stomach or back to relieve the distressing symptoms in these parts are contraindicated, as such applications make the effects of the oncoming eruptions more marked and permanent in the parts to which they are applied.

The disease is profoundly exhausting, and tonics are indicated at this stage and throughout its entire course. Only easily digestible and assimilable yet nutritious food should be offered. Milk, eggs, animal broths, and abundance of pure cold water or lemonade are very acceptable. Mild laxatives may be given in the early stage, and if continued at intervals with care throughout the disease may prevent the constipation which sooner or later may appear as a complication. Stimulants in the forms of sherry or port wines, whiskey or brandy, in free doses and repeated every two or three hours, especially in the afternoon and night, are useful and agreeable adjuvants to the sustaining treatment at any period of the disease. The general treatment adopted in this stage is continued to the end with but little essential change. Complications at any stage are successfully treated upon general principles.

Pain and tension in the skin, and the itching which de-

velops as the eruption becomes vesicular and pustular, are relieved by the application to the parts of cloths wrung out of cold or hot water according to the patient's choice, and frequently changed. Evidently it is the moisture of the applications which produces the soothing effect. As this stage advances, the nose, mouth, soft palate and throat suffer from the eruption, and deglutition becomes difficult and painful. Gargles of chlorate of potash when the patient can use them are of benefit, but most marked relief is obtained from a careful rinsing of the mouth by the nurse with a piece of clean old linen wrapped around her finger and previously dipped in a one to twenty per cent. solution of boric acid. For the same purpose a saturated solution of boric acid in rose water may be used in an atomizer and sprayed frequently over the parts. This spray applied to any afflicted part of the surface of the body is most grateful through the rest of the disease. In sprays not to be used about the nose, mouth or eyes, a solution of corrosive sublimate is useful. Some patients prefer these solutions in the form of spray, and others prefer cloths saturated with them applied to the parts and frequently changed. The intense itching in the late pustular or suppurative stage is relieved by the mixture recommended by Dr. Hare: olive oil and lime water equal parts to which a little carbolic acid or thymoline is added. This can be applied with a large camel-hair throat brush with a long twisted wire handle. These sprays and the oleaginous mixture can be used two or three times daily and in severe cases much oftener. As the disease advances they appear to hasten the falling of the crusts, exclude the air from the skin, and aid in the general work of disinfection. During the height of the secondary fever, the fever of suppuration, daily bichloride sponge baths only can be given, as the patients are too sore and too much swollen to make feasible the giving of immersion baths.

Rupture and dessication of the pustules begins on the

thirteenth or fourteenth day of the eruption. This is the period at which death is most likely to occur from toxæmia produced by absorption of some of the large quantity of pus upon the surface of the body. On account of the energetic efforts which have always been made to tide patients over this period, a treatment employed by me with apparent success in an unusually severe case of confluent small-pox may be worthy of mention. On the eleventh day of the eruption, and therefore two or three days before rupture and dessication of the pustules, patient had an evening temperature of 105.5 Fahr. Face, arms, forearms, hands, legs and feet were intensely swollen and œdematous. Patient profoundly apathetic. I injected subcutaneously under strict antiseptic conditions into the tissues of the back ten c.c. of antistreptococcus serum; two similar injections at intervals of twenty-four hours were made into the forearm and thigh respectively. In about twelve hours after the first injection the œdema about the eyelids began to subside, patient could move his eyelashes; a similar change took place about the mouth, and the profound apathy rapidly abated. The breathing and pulse also improved. In a few hours after the last injection the morning temperature was normal. It was fully sixteen days later, however, before the patient ceased to have an afternoon temperature of a degree or a degree and a half. Patient made a good recovery, and developed no abscesses nor sores at any time. I had but one case seriously ill enough to indicate this treatment; nevertheless, I consider the improvement after injections rather more than a coincidence.

When suppuration and the secondary fever have subsided, and the crusts, or at least a crop or two of them, have fallen, the patient is given three thorough antiseptic baths at intervals of twenty-four hours. Then he gets a clean, fresh suit of clothes, is removed to an uninfected part of the building or, if the weather will permit, to a tent

outside the grounds, where the antiseptic bathing is continued for three days more. Then all his belongings which it is not deemed advisable to destroy by burning are placed in a large wooden receptacle, where they are exposed to formaldehyde vapor for twelve to fourteen hours, and then the patient is dismissed. Ambulance drivers, ambulances and their effects should all be disinfected and fumigated.

In the present visitation of the disease in the United States not much of the usually fatal hæmorrhagic variety of the disease is seen. I have not seen a case. In an extensive survey of the literature of the subject, the few remedies concerning whose probable efficacy there is the greatest agreement amongst writers are turpentine and ergot in liberal doses, carbonate of ammonium, quinine, and the practice of transfusion.

In country towns, or in the country in general, where there is no isolation hospital and the patients must be confined in a private house, the general course indicated should be pursued as nearly as possible. The room in which the patient is confined should be as far removed from the living rooms as possible. Cloths or sheets kept continually saturated with a disinfecting solution should be suspended in the doorway and at the windows, especially if the windows open upon a street or upon near neighboring houses.

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DISCUSSION.

Dr. F. I. KNIGHT, of Boston: I would like to ask about the use of the red light in the treatment of small-pox. We have heard a great deal about the extraordinary effect of the red light on lessening the severity of the local process going on in the skin.

Dr. C. J. WHITE, of Boston: In regard to the use of the red light, I will say, that so far it has not proved to be efficacious in the treatment of small-pox. No detailed statement about its use in Europe has, however, come to my notice, so perhaps we should not judge definitely about its success across the water; but Dr. Councilman of Boston does not believe in it, and says he has found no benefit resulting from its use.

Dr. BANCROFT, of Boston: In regard to the use of the red light, we fitted up two rooms with the red light. We did this by fixing up curtains. I suppose there were about 20 cases there in all, and we kept them there long enough to see what influence the red light might have on the pitting. One of these cases was very sick, and it was rather a surprise to us that the patient got well, but I have seen many such cases get well. I think from the experience we have had that we cannot claim any great benefit from the red light.

Dr. Durgin spoke about the use of serum. We tried this in 8 or 9 cases which had not been vaccinated, but from these few cases we cannot conclude anything. In two cases it was tried very early, and it seemed to me it might have had some effect. I think it should be tried only in unvaccinated cases, and those cases children.

GENERAL DISCUSSION.

Dr. E. C. NORTON, of Norwood: I think there is reason for not vaccinating in some cases, and would like to ask Dr. McCollom what kind of cases he would give as not suitable to vaccinate?

Dr. MCCOLLOM: Of course there are a few cases, as Dr. Norton says, where it might not be advisable to vaccinate, but they are very few. In answer to his question as to what kind of cases, I would say, if a child is in the last stages of tuberculosis, or, if in the active stage of a very severe attack of scarlet fever, I should not want to vaccinate, and it is a question when a child is having a very severe attack of whooping-cough whether it is wise to vaccinate, although there are some men who claim that whooping-cough has been modified by vaccination. I think, however, that this latter must be an error in observation, as I can hardly see how vaccination would modify whooping-cough.

Dr. H. L. CHASE, of Brookline: I would like to say a word about the vaccination of pregnant women. In the town in which I live opinion is rather against vaccinating pregnant women. The late Dr. Henry Martin was always against doing this unless the woman was much exposed to small-pox. I should like an expression of opinion in regard to this point from Dr. McCollom.

Dr. MCCOLLOM: I have vaccinated a good many pregnant women. In a case of this kind I think it is well to tell the woman just how the matter stands. If she has been exposed to small-pox, tell her she has been exposed, and that there is danger of taking the disease, and many women, when they understand how it is, will be glad to be vaccinated. Of course there are some women who have made up their mind that they will not be vaccinated, and I do not believe in forcing them.

Dr. NICHOLS: I have never seen any harm from vaccinating pregnant women, and if there is any, certainly in this large assemblage of medical men of experience we ought to find out something about it.

Dr. KNIGHT: I would like to ask Dr. McCollom if he thinks any child who is well enough to go to school should be exempt from vaccination.

Dr. MCCOLLOM: I should say if a child is able to go to school, it is able to be vaccinated. I will say right here that I believe the only time when a child should not be vaccinated is when the child is sick with some acute disease, and will succomb to it in a few days.

Dr. J. A. DOUGLASS, of Amesbury: I should like to ask Dr. McCollom how early in the development of small-pox it is communicable to those who have not been vaccinated. Prof. Clark, of New York, stated that it is not communicable until it becomes characteristic, and he cited a number of cases that came into Bellevue Hospital without any history or symptoms of what was coming, except severe fever. They were placed in the fever ward and watched. A few days later, on coming into the ward, the characteristic eruption was observed, and the patients were immediately placed in the small-pox ward. None of the other patients in the fever ward contracted the disease.

I would also like to ask Dr. McCollom what precautions against spreading the disease he considers necessary for a doctor to take when he is attending a case of small-pox, and what he is in the habit of doing to satisfy his other patients, and the sentiment of the community in which he lives.

Dr. MCCOLLOM: In regard to the first question, I think small-pox is communicable from the commencement of the initial fever.

In regard to the second question,—as far as the doctor himself is concerned, of course he should be vaccinated successfully, and after seeing a patient ill with small-pox he should change his clothes.

Dr. C. C. FOSTER, of Cambridge: There is one class of cases that has been brought to my attention, and that is cases of chronic hip-joint or spine disease. Parents of children with these diseases are very loath to have their children vaccinated. These children do not usually go to school, and of course they are not with other children

much. I should think these would be doubtful cases. Where they are "walking-cases" I usually advise vaccination, but the parents often refuse.

Dr. McCollom: In regard to what Dr. Foster has said about these cases of hip-joint disease, I can see no reason why these patients should not be vaccinated. Of course if the children are very much debilitated that puts another light upon it.

Dr. S. W. Abbott: I believe the words, "This child has been successfully vaccinated," should be required on all certificates of vaccination.

I never saw a case that had been communicated from one person to another through the medium of an attending physician, but I did see this peculiar case: During the epidemic of 1872, I had in my stable a cow two or three years old. After seeing a case of small-pox I used to hang my coat up in the stable for the protection of other patients and my family, and that cow had the cow-pox.

Dr. S. Hanscom, of Somerville: I would like to ask Dr. McCollom how soon he would vaccinate an infant?

Dr. McCollom: I would vaccinate a child 48 hours after birth if there was a case of small-pox in the family. I have vaccinated a child 24 hours after birth. Of course it is not necessary to make a large scarification.

Dr. Broughton: I just wish to call attention to one little trick which I found extremely useful in the preparation of the arm for vaccination. After soap and water and scrubbing, one or two strokes of a razor will clean the arm splendidly. Just shave a small spot on the arm. I did this in all my cases, saw no ill effects, and was able to do it rapidly.

Dr. B. R. Symonds, of Salem: We have had a number of cases of small-pox in Salem this winter, and I should like to briefly outline our method of dealing with it, and ask Dr. Durgin if we are using about the same methods that are used in Boston. When we hear of a case we go to the house and remove the patient to the small-pox hospital.

We then vaccinate everyone in that house, and quarantine the house for two weeks. During that time we watch the house rigidly, allowing no one to go to or from the house, and we support and maintain the inmates while the quarantine is on. I would ask Dr. Durgin if he thinks this is necessary; if we could not just vaccinate everybody in the house, or all that have come in contact with the case, and then let them go, simply keeping an eye on them to see if they contract the disease, when they could be immediately removed to the hospital?

Dr. DURGIN: In Boston we have not quarantined the house, but have immediately taken the patient away, cleaned up, and vaccinated the others. After this I see no reason for quarantining the house. I believe it is important to watch those who have been exposed for fifteen days, although you would not expect them to be ill for nine or ten days.

Dr. SYMONDS: As a member of the Board of Health of the City of Salem, and appointed by the City Government, I wish to work for the city's good, and desire to keep the expenses down as much as possible, and do the work most satisfactorily. Being the only medical man on the board I did not want to take any chances. During the time a house has been quarantined we have fed all the inmates of the house, provided the quarantine officers. We have had seven cases of small-pox. I think we should vaccinate them, let them go and watch them, but so far we have vaccinated the people, quarantined and fed them, and have had but very few cases. Nearly, if not every case, has been imported from other places. Our general free vaccination helped us amazingly.

Dr. DURGIN: I am very glad to hear this good report of Dr. Symonds. The remark has been made by Dr. McCollom, during the meeting, that it would be better to call the place for small-pox patients the "Small-pox Hospital," rather than the "Pest-house." Many persons in the community think that when one enters the pest-house it means "good-bye forever." Great dread is associated with that word, and we are trying to do away with it, and are

calling the place the "Small-pox Hospital," and we are succeeding, by making it as inviting and comfortable as possible to those who go there. While we take cases away from home to the hospital, I believe we should do everything in our power to overcome this natural dread by calling it an hospital, and making the people feel that every comfort will be provided for the sick person.

In regard to vaccinating children who are not very well, it has been the custom for many years to bring such children to the Board of Health office and try to get them into school without vaccination. I have always tried to persuade parents to have their children vaccinated, and have almost invariably succeeded. In this way hundreds of such children have been vaccinated, and I have never seen any bad effects from it. I believe that this can safely be done in 99 out of every 100 children whose parents want to get them into school without vaccination.

In regard to vaccination in pregnancy, I have vaccinated a very large number of cases in pregnancy, believing that the danger was trifling, and I have never seen a single instance where it proved of the slightest harm. I have had the misfortune to see more than 50 cases of death from small-pox in pregnant women. The most that you would fear from vaccination would be the loss of the child. That would almost always result if the mother contracted small-pox, and she herself is almost certain to die. Now, then, you have your choice between the chances of small-pox, in which you may well expect to lose both mother and child, and the chances of vaccinia, in which you have little reason to fear any bad result. It seems to me that the question reduces itself to a very plain conclusion.

Dr. R. H. Ferguson, of Dorchester: Dr. Grinnell, of the University of Vermont, told me of an instance in which a cadaver in the dissecting-room was found to have died of small-pox, and quite a number of students had been examining it and had been going about amongst people attending to their duties. When it was found to be so, he isolated as many of the students as he could get hold of, although many of them had gone home. He telegraphed to the demonstrator of anatomy who was in Washington at the time, and received reply saying that it was utterly impossible for

a person to get small-pox from a cadaver with small-pox. Now, I have looked up the literature on the subject, and I have found nothing that would lead me to suppose that a person cannot get small-pox from a cadaver, and would like to hear what Dr. McCollom has to say on the subject.

Dr. McCollom: It is perfectly possible for a person to take small-pox from a cadaver. I think the man who makes the statement that this is impossible is very much mistaken. The mere fact that the students who had been exposed did not have the small-pox was good luck, or they had been very well vaccinated.

Dr. W. T. Clark, of Worcester: In my capacity as health officer I frequently receive notices from physicians who have vaccinated children several times without any effect. I either refer these children back and ask the doctor to try again, or do it myself. I would like to ask Dr. McCollom if he has ever seen a case that he never succeeded in vaccinating.

Dr. McCollom: In answer to Dr. Clark's question, I will say, that I have known of one instance where a person could not be vaccinated. That man was vaccinated fifteen times, but it was found that his mother had had small-pox when he was in utero. I think there are very few cases that cannot be successfully vaccinated if the physician will persist.

Dr. E. F. Gage, of Winthrop: I would like to ask Dr. McCollom how long an attack of small-pox will confer immunity to the disease?

Dr. McCollom: I do not know as I can quite answer that question, but I do think that an efficient vaccination is just as effective. I think where there is an epidemic even if a person had small-pox ten or fifteen years before, it is well to vaccinate,

Dr. Chase: I would like to ask Dr. McCollom if vaccination of a woman in pregnancy would confer any immunity on the child?

Dr. McCollom: I do not think it would.

Dr. G. N. P. MEAD, of Winchester: I should like to ask what is considered a successful vaccination. As we all know, there are some cases where there is some redness, a little swelling, slight pain in axilla, and a very slight discharge. A crust forms, and in a few weeks there is no scar.

Dr. DURGIN: I will say, that, as far as my observation is concerned, in primary cases especially, all the stages of vaccination should be well defined. There should be the well-defined vesicle, pustule, umblication and crust, covering a period of time not less than three weeks. Of course in re-vaccinations we find the appearance of the arm falling short of typical characteristics of vaccination. I regard this as a very important question, and if we have not already wearied Dr. McCollom too much, I would like to hear from him.

Dr. MCCOLLOM: As far as primary vaccination is concerned, I think the appearance is very characteristic. Regarding the secondary vaccination, it is sometimes very difficult to decide whether the vaccination has taken or not, but if the arm begins to show redness and slight irritation at the end of twenty-four hours, the vaccination is not a success. On the other hand, if in a secondary vaccination the patient in six days has a small vesicle surrounded by an areola, you may be sure that person has been successfully revaccinated.

ARTICLES XI.–XIV.

THE USE OF ALCOHOL IN MEDICINE.

THE NUTRITIVE VALUE OF ALCOHOL.

By FRANCIS G. BENEDICT, Ph.D.

OF MIDDLETOWN, CONN.

THE BASIS FOR THE USE OF ALCOHOL IN THERAPEUTICS.

By ARTHUR N. CUSHNY, M.D.

OF ANN ARBOR, MICH.

THE INFLUENCE OF ALCOHOL UPON INFECTION AND ITS USE IN THE TREATMENT OF ACUTE INFECTIOUS DISEASES.

By SAMUEL J. MELTZER, M.D.

OF NEW YORK CITY.

THE COMMON USE OF ALCOHOL AS A BEVERAGE.

By GRAHAM LUSK, Ph.D.

OF NEW YORK CITY.

READ JUNE 11, 1902.

ARTICLE XI.

THE NUTRITIVE VALUE OF ALCOHOL.

By FRANCIS G. BENEDICT, PH.D.
OF MIDDLETOWN, CONN.

In view of the widespread use of beverages containing from 3 to 70% of ethyl alcohol the inquiry as to whether this chemical compound possesses any nutritive value is a proper one. The inquiry is of especial importance to the medical practitioner, since alcohol is used to a very considerable extent in therapeutics and dietetics.

In discussing the nutritive value of any food material it is necessary to see in how far the substance under examination possesses certain chemical and physical properties common to our ordinary foodstuffs, and in how far it performs the commonly accepted functions of food, and what disadvantages, if any, exist as to its permanent and universal use. We may say that a food material should (1) be palatable *per se*, or be capable of being prepared in a palatable manner, otherwise the ingestion of sufficient quantity to play any rôle in nutrition would not long be tolerated; (2) it should be capable of being absorbed as it passes through the alimentary tract; (3) when absorbed it must serve either to furnish tissue-building material and thereby aid the growing organism and repair waste, or it must furnish fuel to keep the body warm and supply energy for internal or external muscular work—in performing either or both of these functions it must of necessity spare body material from con-

sumption; and (4) it should "agree" with people, that is, cause no stomach and other disturbances.

In the fullest and widest sense of the phrase "nutritive value" we should doubtless include an estimate of the cost of such an ingredient of a general diet.

Without considering the question of palatability or pecuniary cost of alcohol in its various forms, we come at once to the question of its absorption in the body.

The absorption of any material through the mucous lining of the alimentary tract is largely dependent on the solubility of the material and the size of the molecule. When we consider the size of the proteid molecule of our common food materials, the complex molecule of the fats and even the relatively large molecule of the soluble carbohydrates, the simple structure and size of the molecule of ethyl hydroxide, leads us to expect what actually does occur, namely, a very rapid and complete absorption. This absorption takes place in the stomach, and indeed is so rapid that comparatively very little alcohol may enter the intestine. We may then properly speak of alcohol as predigested, for the action of digestive juices is not necessary to prepare it for absorption. This is true of but few of our recognized food substances.

While nearly all soluble materials would be absorbed to a greater or less extent in the alimentary tract, only those which contribute directly to the support of the body can properly be considered as possessing any nutritive value, and we should now determine whether alcohol when once absorbed can perform either of the functions of food, that is, build and repair tissue or supply energy for fuel and muscular work, or is excreted unchanged. Formerly the opinion prevailed that alcohol while readily absorbed was excreted unchanged, as is, for example, the coal-tar, sweetening substance, saccharin, and consequently *a priori* could be of no benefit to the body. A most careful examination of all the excretory products has, however, shown that in

doses not exceeding 72.5 gm. per twenty-four hours, less than 2% of the alcohol is excreted as such from the body of a healthy man.* In no possible way can there be any great error in this observation, for the subjects were enclosed in an air-tight respiration chamber, and the amount of alcohol in the ventilating air current, urine and perspiration was determined with great accuracy. We may say that in moderate doses, at least, the alcohol is practically entirely oxidized in the body, but a small portion, in general 2 to 4% being excreted unchanged.

This fact being established the results of the transformation may be more closely studied. The proteid molecule, the chemical basis of muscular tissue, is characterized by containing the chemical element nitrogen in exceedingly complex combination, and it has been found that only that portion of our food containing nitrogen in similar form can contribute to the structure or repair of muscular tissue. Obviously the simple molecule of ethyl hydroxide containing no nitrogen cannot be considered as in any sense performing this important function of food. It must be borne in mind, however, that but a small part of our ordinary diet is capable of performing this function, and we must class with alcohol, as thus failing to build muscular tissue, the carbohydrates and fats of the diet from which the body obtains the larger share of its energy.

If we reason again from the structure of the alcohol molecule, we shall see that it is also incapable of contributing directly to the synthesis of fatty tissue, for from the well known composition of the fats we know that in their synthesis certain complex radicals are necessary, that is, the long carbon chains of the fatty acids or carbohydrates and the residue of the glycerine molecule, a chain of three carbon atoms. All experiments thus far† have failed to de-

* Memoirs of the National Academy of Science, Sixth Memoir, 1902, viii, pp. 392–393.

† Rosenfeld: Der Einfluss des Alkohols auf den Organismus, 1901; p. 31.

monstrate or even imply that alcohol can enter into the structure of the body, and we are led to the belief that not only it cannot build muscular tissue, in which failing it resembles the carbohydrates and fats, but unlike these it cannot also contribute to the structure of the adipose tissue. It is, in a word, in no sense a tissue-builder and therefore fails in one of the most important functions of a food.

We shall see later, however, that even though the organism is probably unable to build tissue from alcohol, alcohol does nevertheless exercise a very powerful influence on the formation and store of fatty tissue.

Physiological research has proven definitely that alcohol is oxidized in the body, and it the law of the conservation of energy obtains in the living organism, as we have every reason to believe it does, the potential energy of the alcohol must be transformed into kinetic energy in the body, either in the form of heat or internal and external muscular work. As the body needs a certain amount of heat to keep it warm, alcohol may thus be of benefit in furnishing a supply of heat.

Although a large number of experiments on the physiological action of alcohol have been made both on man and animals, the effect on the production of heat within the body was not investigated until 1890, when Reichert* made a number of short experiments (five to six hours) on dogs. These experiments, while extremely interesting and carried out with this investigator's usual skill and care, have not the bearing on the question immediately under discussion, namely, its action on man, that we see more perfectly in experiments with men. Of these latter experiments all have been made with the Atwater-Rosa respiration calorimeter at Wesleyan University.† The method of experimenting may be briefly described as follows: The subject is placed on a prescribed diet, suited as nearly as possible to the

* Therapeutic Gazette, February, 1890.

† Bulletin 63, Office of Experiment Stations, U. S. Department of Agriculture, 1899.

needs of his body, and after a four days' preliminary digestion experiment enters the respiration calorimeter. The chamber consists of a tight-walled copper box large enough to permit a man to live with comparative comfort for from three to twelve days. A ventilating current of air furnishes the means for determining the gaseous excretions, while careful analyses of feces and urine and perspiration, as well as food and drink, give the factors for striking a balance of income and outgo of matter. As the energy of the food is measured by combustion with oxygen in a calorimetric bomb,* and the dry matter of the feces and urine similarly burned, the measurements of heat radiated from the body complete the data for striking a balance of income and outgo of energy after making due allowance for the body material gained or lost. The amount of water vapor, carbon dioxide and alcohol† in the air current is determined. The appliances for measuring heat are novel and insure great accuracy. As a direct check on the accuracy of the apparatus for determining water, carbon dioxide and heat, a weighed quantitity of pure ethyl alcohol is burned in a lamp inside the chamber and the products of combustion as well as the heat measured. The amounts as determined agree with the theoretical quantities calculated from the weight of alcohol burned to within 1%—an accuracy sufficient for physiological experimenting.

When the factors for income and outgo are compared in these experiments we have a striking demonstration that the law of the conservation of energy obtains in the living organism, for it is found that the average of all experiments shows an agreement between the potential energy of the material actually oxidized in the body and the kinetie energy liberated in the oxidation in form of heat, which is inside of 1%. In some experiments 72.5 gm. of alcohol, equivalent to about 500 calories of energy, were substituted in a diet

* Storr's (Conn.) Experiment Station Report, 1897, p. 199.
† Journal American Chemical Society, 1898, 20, p. 299.

for fats and carbohydrates. The close agreement observed in all experiments with the non-alcohol diet was obtained in all the experiments with alcohol.

Having thus seen that alcohol in quantities here used, that is, 72.5 gm. per day, is oxidized in the body and the latent energy transformed into heat, it remains to be seen in what way, if any, this liberation of heat is of service to the body. If, as is commonly supposed, the alcohol is rapidly burned in the body and the heat thus liberated dissipated in a short time, the value of such a supply of heat may be questioned; but when we examine the analytical data we see that there was neither an excessively rapid combustion nor was there any abnormal radiation of heat from the body.* The experiments of Reichert, previously referred to, did indeed indicate a slight increase of heat radiation as the result of administering alcohol; with man this was not noticed, though the experiments were frequently of from five to nine days' duration.

It is well known that with excessive doses of alcohol the pharmacodynamic action on the nervous system results in a marked lowering of the body temperature.† The temperature observations made during the experiments with the respiration calorimeter fail to show any diminution in body temperature—a result that is in accord with practically all previous work in which moderate doses of alcohol were ingested. It is reasonable, therefore, to assume that the energy furnished by the alcohol does aid the body in maintaining its temperature and may be of service in the performance of internal and external muscular work. The proof of this latter point is, however, not at hand. That the energy furnished by alcohol does not in part, at least, contribute to the performance of muscular work, involves the assumption that the energy thus furnished is of a different

* Memoirs of the National Academy of Sciences, 1902, Sixth Memoir, viii, 272-276.

† Schaefer's Physiology, 1898, i, 820.

nature from that yielded by the fats and carbohydrates in their combustion. We may say that it is highly probable that such a difference does not exist, and assume with an equal degree of probability that the energy required for muscular work is drawn from the oxidation of alcohol as well as from the other food ingredients. As a matter of fact, when the total energy transformed with a diet containing no alcohol is compared with that transformed in a similar, parallel experiment in which 500 calories of the diet are furnished by alcohol, no noticeable difference appears. So far, then, as these experiments go, and with the quantities of alcohol used, no difference can be detected between the energy furnished the body by alcohol and that furnished by the ordinary nutrients of food, and, though failing to build tissue, alcohol can properly be classed as a source of energy to the body.

In thus furnishing fuel to the body it must spare either other food material or, what is still more important, body material from consumption. A diet deficient in energy results in an immediate draft upon the body material, chiefly fat, for the lacking energy. Alcohol added to such a diet invariably lessens the quantity of body material disintegrated. Similarly a diet just sufficient to maintain the body in equilibrium, when augmented by alcohol, results in a storage of fat in the body, or, if the diet is more than sufficient and fat has been stored, the amount stored will be increased. Marked instances of this protecting power of alcohol for fat are to be found in the published data of the Middletown experiments.

The contention has frequently been made that alcohol, even in moderate doses, influences the general metabolism of the body in such a way as either to increase or diminish the production of carbon dioxide and the consumption of oxygen. Widely varying results have been obtained on this point, though the best and most trustworthy work

shows that the variations in the carbon dioxide production and oxygen consumption are no larger than the variations appearing in a diet containing our ordinary nutrients.

Another and more serious question has been the effect of alcohol on proteid metabolism. Does the ingestion of a moderate amount of alcohol in twenty-four hours result in a more rapid disintegration of muscular tissue? This question naturally arose from the observation frequently made that in many instances the day after the ingestion of alcohol following an alcohol-free diet the nitrogen elimination in the urine is noticeably greater than before.* If we carefully examine all the experimental evidence it must be admitted that on the whole no tendency of alcohol to exert a direct poisonous action on proteid metabolism can be noted, for while the experiments of short duration in most instances show a somewhat greater elimination of nitrogen in the urine on the few days immediately following the ingestion of alcohol, the experiments of long duration invariably show that in a few days the normal excretion is soon re-established, and in many instances a gain of nitrogenous material to the body is clearly shown. The whole matter rests on the loss of a gram or two of nitrogen; and in interpreting the results of experiments of this nature, it is necessary to take into consideration several important points: (1) The elimination of nitrogen in the urine is not a measure of the tissue destroyed; (2) the diuretic effect† of alcohol might account for the slight increase in nitrogen elimination generally appearing for a few days after the ingestion of alcohol; (3) any marked change in diet, even when the nitrogen content is unaltered, is often accompanied by a marked disturbance of the nitrogenous equilibrium, and whatever fluctuations of the equilibrium are caused by alcohol in the diet are no greater than those

* Rosemann: Der Einfluss des Alkohols auf den Eiweissstoffwechsel, Arch f. d. ges. Physiol, 1901: Bd. 86, pp. 307–503; Rosenfeld: Der Einfluss des Alkohols auf den Organismus (1901) pp. 7–22.

† Rintaro Mori: Arch. f. Hygiene, (1887) vii, 354.

caused by the ingestion of fat* under exactly similar conditions. The whole body seems to undergo a process of readjustment when a new diet is given, and in some instances the first few days are marked by a loss of nitrogen in the urine, as is the case when alcohol or fat are included in the diet, while in others the change is accompanied by a gain of nitrogen to the body.

We may safely say that the most accurate experiments give no positive proof or even valid ground for asserting that alcohol in moderate doses influences proteid metabolism any more than does fat. It cannot properly be designated as "proteid poison,"† but it can and frequently does protect body proteid from consumption.

While when used moderately alcohol may be said to "agree" with most people, its rapid absorption precluding difficulties of digestion; when used in excess, on the other hand, it produces, as do many of our common food materials, stomachic and other disturbances that are frequently of a serious nature. Unlike an inordinate fondness for sweets, nature does not rebel so vigorously against an excessive use of alcohol, and while opsomaniacs are relatively uncommon, dipsomaniacs are only too common. Even the coffee and tea habits cannot be compared in any sense with the strong habit so frequently acquired by users of alcohol. It is just this habit-forming property of alcohol leading to its consumption in excessive quantities, under which conditions the distinctly toxic properties of the compound are so manifest, that brings us to a halt in our estimate of the nutritive value of alcohol. The toxic properties of alcohol are not possessed by any other common food material, and consequently must be considered a drawback to its habitual use for nutriment in quantities large and small. Furthermore, if excessive doses are so disastrously toxic, may we not reasonably question the effect of moderate doses and

*Kayser: v. Noordens Beiträge, H. 2, S. 1.
†Miura: v. Noordens Beiträge, H. 1, S. 1.

suspect an insidious action, that may not be apparent in the necessarily short chemical, physical and physiological examination, of the subject, food and excreta, which is afforded by the usual experimental period. Experiments in the chemical or physiological laboratory, no matter how accurately made, can never of themselves furnish the data for determining satisfactorily the effects of the persistent use of moderate quantities of alcohol upon the general bodily and mental condition of man. It is to the pathologist and psychologist that we must look for answers to this question. While accurate and impartial observations on this point are rarely found, surely the work of Kraepelin,* Aschaffenburg† and Hodge‡ is significant in its indications, and we must, at least, hold that alcohol has in many instances, even in moderate doses, a retarding action on many vital processes, and accordingly should be used for nutriment only with full cognizance of such action.

From a review of the work up to the present time, it can be seen that it would be manifestly unfair not to accord to alcohol a value as fuel and as a protector of body material — a value that may at times be of incalculable service to the physician, but would it not be equally manifestly unfair to deny that the latent toxic property of alcohol is such that in many, if not in the majority of cases in which it is used as a food, such use is irrational?

In health obviously the multitude of other materials whose nutritive value is beyond dispute renders the use of alcohol as a food entirely unnecessary. Pathological conditions in which nutriment from this source alone can be used are comparatively rare, though in many cases, as in acute infectious diseases, doubtless the ease of absorption and high calorific value more than counterbalance the toxic effects. Upon the intelligence of the physician, however, should rest the use of this compound as nutriment.

* Psychologische Arbeiten, vols. 1 and 3.
† Inaugural Dissertation Jena (1894).
‡ Popular Science Monthly, 50, pp. 796–812 (1897).

ARTICLE XII.

THE BASIS FOR THE USE OF ALCOHOL IN THERAPEUTICS.

By ARTHUR B. CUSHNY, M.D.

OF ANN ARBOR, MICH.

I HAVE, first of all, to thank you for the compliment you have paid me in inviting me to take part in this discussion. It is true that I might have selected another topic in preference to one which has been in the past and still is the cause of so much heart-burning as the therapeutic use of alcohol. But, at the same time, the position of the pharmacologists has been so much misunderstood, that I am very glad to have an opportunity to place it in its proper light. And as a pharmacologist I first must utter a protest against the prevalent idea that we base our statements wholly upon animal experiments. Any observation as to the action of a drug that is made in such a definite way that it can be verified by others is gratefully accepted by us, whether the subject of the experiment be a human being, sick or well, or one of the lower animals. But where a physician gives merely an impression, colored by his temperament or his hopes, we cannot take cognizance of it; and in this the pharmacologist differs in no whit from the medical profession, in which the danger of accepting subjective impressions as evidence is generally recognized.

In regard to the use of alcohol in therapeutics, perhaps more than in the case of most drugs, this tendency to substitute impressions for verifiable facts prevails, and in look-

ing over the more recent therapeutic literature of the subject I have been struck by the almost complete absence of observations in which changes in the pulse, respiration or temperature are recorded in any more definite way than by such expressions as "improved, strengthened, relieved." The experimental pharmacology of alcohol is now fairly well known; may we workers in the laboratory not expect something more definite from the clinicians?

The difference between the experimental observers and the clinicians in regard to alcohol is largely one of interpretation and not of facts. Each has exceeded the limits of the province in which alone his opinions should be paramount and has invaded that of the other, in which his experience is limited. Thus the experimentalist, basing his opinions on a limited number of observations, may be heard announcing that alcohol is of no value in disease. He forgets that effects that are deleterious in one organ are often more than counterbalanced by changes wrought elsewhere, and that our knowledge of the action of drugs and of pathology is far too limited to permit us to deduce general rules in therapeutics. On the other hand, the clinician lays himself open to attack when he attempts to interpret in scientific terms the phenomena of which he is a witness at the bedside. As long as he confines himself to stating that alcohol is of value in a disease, he is beyond the reach of a laboratory worker. His statements may be disputed by other clinicians, but the experimentalist is incompetent to do so. But when he explains that the effects he has observed are due to the action of alcohol on the heart or to its stimulating the central nervous system, he invades the territory of the experimental investigator, who has a right to criticise such interpretations on the basis of his own results, which, though few in number, permit of more accurate inferences being drawn from them. The discrepancy between the views of different observers in the question of alcohol is, therefore, to

be dissipated by more mutual consideration; the clinician, while maintaining the correctness of his observed facts, must be prepared to modify his theories in view of the experimental results; the laboratory worker must accept the clinical facts, as equally valid with those in his own experience, and must adapt his theories to these facts or abandon them.

I have thought it necessary to make these prefatory remarks because there seems to be a quite unnecessary divergence of views as to the question of alcohol. I shall now consider successively the changes elicited by alcohol in the central nervous system, the respiration, the heart and the digestion, and the question of its value as a food, and shall attempt to determine how far the experimental results agree with the clinical.

The effects of alcohol on the central nervous system differ very considerably in different individuals. In the lower animals they are marked by depression, the symptoms being exactly similar to those of chloral or of the other narcotics. Occasionally, a transient excitation occurs, but this is due to the irritant action in the stomach, and is absent when more dilute solutions are administered or when the alcohol is ingested in small repeated doses. In human beings the same depressant effect is often seen, the first symptoms being more or less drowsiness and heaviness, which subsequently pass into slumber. But in the majority of cases the first effects elicited are feelings of good-fellowship, well-being and liveliness, with increased confidence in the mental and physical powers. This is often followed by some excitement, marked by loquacity, laughter and exaggerated movements of all kinds. The face is flushed, the eyes bright and the pulse and respiration are accelerated. Larger quantities lead to uncertainty and inco-ordination of the movements, shown in difficult and stammering speech and staggering gait, and still larger amounts induce sleep and narcosis, which may pass into complete anæsthesia, and eventually

prove fatal. The symptoms of intoxication, therefore, appear to differ in the lower animals and in man, for, while in the former there are no signs of excitement, in the latter this feature may be very marked in the beginning. And even in man the effects of alcohol offer marked contrasts in different individuals and even in the same individual at different times. For the excitement is very much more marked when drinking is indulged in in company with others, while when alcohol is taken with less exhilarating environments or in solitude, the excitement stage is very much less marked or may be entirely absent.

The effects of alcohol have been explained in two different ways: The first view, which appears at first sight to be the more natural one, is that it stimulates the cerebral cells to greater activity and then depresses them; that is, alcohol is believed to act on the cerebral gray matter in the same way as strychnin on the spinal cord. And this view, that alcohol is a central nervous stimulant, is still very widely entertained both by the laity and by clinicians, while the majority of experimental observers rather leans to the view suggested by Schmiedeberg and supported by Bunge, Kraepelin and many others, that the stimulation of the brain is only apparent. According to this theory, the excitement is caused, not by the augmented vitality of the nerve cells, but by a loss of the associations which ordinarily retard the expression of mental activity. To adopt a mechanical simile, the brain may be compared to an engine fitted with powerful brakes. An acceleration of the motion may be due either to increased power of the engine (stimulation) or to the brakes being raised, and it may be very difficult for an onlooker to determine which is the true explanation. The apparent evidences of increased mental activity under alcohol, however, have proved for the most part illusory, when carefully investigated. The closer one approaches to the engine, the more evident it becomes that what appeared to be the

result of increased power is really the effect of the removal of the brakes. One argument against the stimulant action of alcohol is the narrow limits to which it is confined. All the central nervous stimulants with which we are acquainted act on some particular part, in small doses, it is true, but when larger amounts are ingested, the stimulant action spreads over a wider area of the central nervous system and gives rise to the symptoms characteristic of stimulation of that area. Caffein, for example, first stimulates the mental functions apparently, but in larger quantities involves the motor sphere of the brain and may finally stimulate the cells of the cord. Alcohol, on the other hand, appears to have only a depressant action on nervous tissues, except in the human cerebrum. It is true that the exceptional development of the human brain might permit of a departure which is without analogy with other forms of poisoning.

But when the excitement stage is more closely investigated, it becomes apparent that all the cerebral functions are not facilitated by alcohol. It is common knowledge that under the influence of alcohol an individual may be more brilliant in conversation, more witty, more social, more generous in sentiment, but that he is not so careful in his statements, and has not that consideration for his own position or that of others which he ordinarily manifests. He loses his self-control and self-restraint, and thereby often proves more entertaining and social than in ordinary life, but he also loses his sense of responsibility and his power of discriminating between the trivial and the important or between the merely plausible and the actually proved. In a word, it is generally recognized that some of the highest functions of the brain are thrown out of action by alcohol administered in quantities which induce the phase of exhilaration. The further question is what functions are actually increased in activity and how far is this increase dependent upon the reduced activity of the processes which are depressed by al-

cohol. The question is of course a psychological one, which can be answered only by a psychological analysis, which is as yet very far from complete. But it is obvious to everyone that the exhilarations may be due to a loosening of the associations which ordinarily control our actions and feelings. The normal adult, in an environment which in a child would cause every symptom of exhilaration, maintains his self-control, partly because the position has lost its novelty, that is, he has associations which are wanting in the child, partly because the exuberance and gesticulations natural to the child are kept in check by his sense of the ridiculousness of these manifestations in later years. Remove these inhibiting associations, destroy the self-control of adult life, and the man becomes a child again in his sense of exhilaration and symptoms of excitement. It would take more time than I have at my disposal to enter further into these considerations. My object is attained if I have suggested to you that the symptoms of intoxication, which are ordinarily regarded as indicating stimulation of the brain, do not necessarily involve this interpretation, but may be explained by a removal of those associations which ordinarily inhibit the external manifestations of emotion.

Much valuable evidence as to the effect of alcohol on mental processes has been gathered in the psychological laboratories, especially by Kraepelin and his pupils, who have subjected the question to a large number of ingenious psychological tests in the past few years. Even before Kraepelin took up the theme, however, it was generally recognized that the supposed effect of alcohol in increasing the ability to do work and increasing the resistance to fatigue was really contrary to practical experience. Over and over again it has been demonstrated beyond question that regiments supplied with alcoholic liquors are less capable of long marches and suffer more from fatigue than others to which no alcohol is issued. But Kraepelin has shown this to hold

good for forms of work in which more mental capacity is required than the marching of soldiers. For typesetters do a smaller amount of work and make a much larger number of misprints when even a small amount of alcohol is allowed, than when they perform their work without this drug. And other tests performed by Kraepelin and his students all show a lessened capacity for mental work and a smaller ability to keep the attention directed to one object. Thus, when a student was set to learn a number of meaningless syllables or a row of figures, he took a longer time to do so and made more errors in repeating them under alcohol than normally. Similarly arithmetical calculations of all kinds were carried out much more slowly and with more errors, and the writing was slower and gave the impression of being that of an uneducated person who seldom had occasion to use his pen. Only in one respect was any increased aptitude shown, namely, in the transformation of an idea into movement. This might suggest that the motor functions are accelerated under alcohol, but another explanation is equally applicable, namely, that an ordinary movement is hampered by a series of associations and that when these are destroyed by alcohol the movement may be carried out more quickly. At the same time the associations in ordinary life not only retard the movement but also restrict and direct it, and the result of their absence under alcohol is shown by the awkwardness and inaccuracy with which the movement is executed.

It is noteworthy that in these experiments, those mental processes which were ordinarily performed readily were less retarded than others in which the subject was less practised and which required more effort. That is, the powers most recently acquired and most readily lost are those on which alcohol first acts, while those operations which have become habitual are less impaired. This is in complete accord with what is observed in the earlier stage of intoxication or exhilaration. The most recent acquisitions in adult life are

the power of self-control and the feeling of self-respect which are manifested in regard for the conventions of life and in the prudence which leads one to avoid many procedures which in earlier life he might have indulged in without reproach. And under alcohol these are the first mental processes to be disordered. *In vino veritas:* in intoxication the natural man is exposed, stripped of the trammels of convention and robbed of the fruits of experience and education.

Many other results of these experiments are of interest, but cannot be entered on here. One feature which bears a familiar aspect and which was brought out clearly in many instances, is the confidence of the subject of the experiment that his efforts were unusually successful under alcohol while the impartial record showed results far below the level attained during abstinence.

In all of these experiments the amount of alcohol taken was small, in no case sufficient to induce any of the more evident symptoms of intoxication. It is therefore of great interest to find in the later publications of Kraepelin's laboratory, that distinct impairment of the psychical powers were found to persist for a much longer time than would be anticipated; the average efficiency was not regained until from twelve to twenty-four hours had elapsed after the alcohol had been taken. If this proves to be true in the case of persons who have acquired a tolerance for alcohol, many individuals are never completely normal, their mental powers never recovering entirely from one dose of alcohol before the next is taken. Some interesting observations regarding the length of time during which alcohol may be retained in the body unoxidized have recently been made by Grehant. He found that in animals to which a large dose had been given, alcohol may be detected in the tissues for twenty-four hours.

The results of these investigations on the mental state under alcohol as well as many others which I have not dis-

cussed, appear to place the theory that alcohol acts as a narcotic upon a firm basis. I do not hold that it is absolutely determined, but some more satisfactory evidence must be brought forward in favor of the stimulation theory before it can be considered as a rival of that of Schmiedeberg. And this evidence must be more definite than is ordinarily offered. It must define what functions are stimulated, and must not be a repetition of the old statement, that the tone and vigor of the nervous system is maintained by alcohol.

But the acceptation of the narcotic theory is not equivalent to condemning the therapeutic use of alcohol for its effects on the brain, as is apparently supposed. We must rather consider whether the results aimed at by the clinician, when he prescribes alcohol, have not been misnamed stimulation, and whether they are not narcotic in nature, and hence in entire agreement with the experimental results. And it is difficult to understand what use we could make of alcohol in disease were it a cerebral stimulant; for no mental exertion is encouraged in acute disease, but every effort is made to restrain the activities of the patient in every direction. The room is darkened, every noise is excluded as far as possible, exciting conversation and reading are forbidden. How absurd it would be to take all these precautions to induce bodily and mental rest, and at the same time to order a drug with the intention of promoting cerebral activity. The truth appears to be that when the clinician applies the term stimulant to alcohol, he uses the word in quite a different sense from that in which it is understood by the experimental observer. His meaning is less definite, and he wishes to indicate only the improvement often noted in the general condition without considering whether this is due to an augmentation or a retardation of the mental processes. The same confusion is met with in regard to opium, which also was formerly regarded as possessing stimulant properties which recommended its

use in acute diseases accompanied by cerebral symptoms. The result of both drugs is in reality cerebral depression, which manifests itself in a condition of euphoria. The disease often loses its strongest ally when the anxiety and worry of the patient are allayed by alcohol. He feels less concern and more resignation, not through his soul rising triumphant through the stimulant action of alcohol, but through his brain being less capable of dwelling on his disabilities, because it is partially narcotized.

The depressant or narcotic action of alcohol, then, far from being in conflict with its clinical use, supplies a definite and logical explanation of the improvement so often noted at the bedside after its administration. And this effect of alcohol in allaying the subjective symptoms, relieving the nervous strain, and promoting the rest and comfort of the patient, is not surpassed by that of any other drug. For while the narcotics are legion and new ones arise monthly to supply the place of those discredited, few of them act on the cerebrum with equal power without involving other organs. None of them can be taken more readily and act less on the alimentary tract, and the great majority of them reduce the activity of the vital centres in the medulla along with that of the higher brain. The distinctive feature of alcoholic action is a slight depression of the mental faculties leading to euphoria, which can be elicited without any other organ being affected detrimentally. This action is not a specific one, and in this era of specifics may not appear to be of first-class importance; but as long as we have no specific for many common disorders, anything which induces rest, and thus allows the reparative processes a fairer field, must be considered in combating disease.

The action of alcohol on the respiration has long been a subject of experimental investigation, and although the main facts are now agreed upon, their interpretation is still a matter of dispute. During the exhilaration and excite-

ment of intoxication the number of the respirations is generally found to be increased, but this may be due to the muscular movements and need not indicate any augmentation of the activity of the respiratory centre, and as the excitement is not elicited in therapeutics these observations do not concern us. A number of estimations have been made in cases in which no excitement was induced, and though the results show a good many discrepancies, the evidence thus gained is to the effect that the amount of air inhaled is generally increased by alcohol even when no signs of excitement are displayed, and in some cases when a well-marked narcotic action is elicited.

This is not indisputable evidence, that the respiratory centre is stimulated, however, for some increase in the respiration is induced reflexly by food of any kind when it passes into the stomach, and alcohol may be expected to induce more powerful reflex movements from its irritant action in the stomach. Some investigators have, therefore, ascribed the changes in the respiration after alcohol to reflexes arising from its local action in the stomach, and have denied that it has any direct effect on the respiratory centre except a depressing one, which is only elicited by enormous doses. The question is certainly a difficult one to determine. In some experiments which I have performed the alcohol was diluted and disguised by the addition of syrup containing some volatile oil. I found that a considerable increase in the air breathed occurred after the administration of the mixture, but in some cases in which the same amount of syrup was given without alcohol a similar augmentation followed. Some years ago Loewy attempted to measure the excitability of the respiratory centre more directly than by merely measuring the amount of air breathed before and after alcohol. Unfortunately his experiments were too few to permit of a positive inference being drawn, but they certainly failed to indicate any

increase in the irritability of the centre. It is impossible to take up a definite position in regard to this question, then, and we must wait for further research to determine whether the augmentation of the air inhaled under alcohol is due to direct central action or to reflexes arising from the stomach. It may appear that the whole matter is one of academic interest only, without practical bearing on therapeutics; but on further consideration this is seen not to be the case. For, if the augmented respiration is caused only by the local action in the stomach, this indicates that much of the surplus oxygen is used in doing the work of absorbing the alcohol, and that the rest of the body profits to a correspondingly small extent from the increased aeration. And further, in those conditions in which a respiratory stimulant is indicated, the centre must be conceived to be in such a depressed state that it fails to react to the stimuli supplied by the gases of the blood. This has to be combated by increasing the irritability of the centre, for it would seem improbable that nerve cells which fail to react to the powerful natural stimulus supplied by the accumulation of gases in the blood, can be aroused by the weaker ones arising from gastric irritation. The use of alcohol as a respiratory stimulant is, therefore, not supported by experimental investigation, but on the other hand it is not wholly condemned. When we turn to clinical experience for enlightenment, we find an equally divided verdict. Some physicians advise alcohol in respiratory failure, while others have found it useless, and it is impossible to determine which view is correct, for neither side gives any measurements.

While the position of alcohol as a respiratory stimulant is thus still unsettled, no question whatever can be entertained as regards its effects on the circulation. In small doses it does not affect the heart except through the increased movement when excitement is induced, while in

very large amounts it acts as a cardiac depressant. An ounce of whiskey injected into a dog's vein has the same effect on the heart as the inhalation of chloroform for a short time. Smaller doses have a correspondingly less deleterious action, but whatever dose is used, no increase in the efficiency of the organ follows. Examinations of the pulse in the human subject give a similar result; no change in the rate can be made out apart from the insignificant acceleration due to the act of swallowing and the local irritation; and no alteration has been found in the area of cardiac dulness or by the various methods of estimating the blood pressure in man. As regards the blood vessels, alcohol causes some dilation of the superficial vessels; but this has no effect on the general blood pressure in animals. Very large quantities reduce the blood pressure to some extent, and smaller amounts injected intravenously have the same effect.

Yet alcohol has long enjoyed a reputation as a cardiac stimulant. This is due in part, I think, to the fact that it is often given in desperate cases, and if a favorable result ensues, some credit is given the treatment, while if the case proves fatal it is ascribed to the disease. But I do not think it is to be discarded in circulatory disorders, for here again its cerebral action may prove of value by lessening the anxiety and other mental symptoms. Similarly morphin is of value in hemorrhage, not because it acts on the circulation or accelerates coagulation, but because it prevents restlessness and puts the body in the most favorable position for repair to take place. It may seem paradoxical, but the real basis for the use of alcohol in acute circulatory disturbance appears to be the fact that in ordinary quantities it has no action on the circulation, while it promotes rest.

The effects of alcohol on digestion have been the subject of much controversy, but I think it may be held as proved

that any beneficial results are due to changes effected in the walls of the stomach and intestines, and not to alcohol influencing favorably the activity of the ferments, at any rate in the forms in which it is ordinarily taken. The slight irritant action on the gastric mucous membrane certainly entitles alcohol to a position in the somewhat indefinite group of carminatives, although it has not yet been shown to increase the gastric movements. Its presence in the stomach and intestines appears to promote the absorption from these organs. But apart from these properties which alcohol possesses, in common with many other drugs, it has been shown to alter the gastric functions in a way which, so far as is known at present, is unique. After alcohol reaches the blood a very profuse secretion of fluid takes place into the stomach, it matters not whether the alcohol is given by the mouth or injected as an enema. This fluid sometimes contains considerable quantities of pepsin, sometimes merely traces, this apparently indicating that alcohol does not actually augment the secretion of ferment, but only increases the fluid which carries with it what pepsin is preformed in the gland. It has been recognized of recent years that one of the functions of the stomach is to dilute the food in order to permit of the action of the ferments, and this action of alcohol in promoting the escape of fluid into the stomach may be of advantage in cases in which the mucous membrane fails to react to the presence of food. Again, it has been demonstrated beyond question that the secretion of the stomach depends largely upon the appetite and the taste and odor of the food. Persons to whose senses alcohol and its accompanying ethers are grateful, may thus be able to digest food taken with alcohol better than they otherwise would, and some supporters of the narcotic action of alcohol believe that its effect in promoting sociability and "making glad the heart of man" may also predispose the individual to enjoy his food, and thus indirectly accelerate its digestion.

It is obvious that these various factors may reinforce each other in some conditions, while in others they may have less obvious results, or may even be in abeyance, and this is in accord with the results of clinical observations. For while some have found that in the human stomach alcohol accelerates proteolysis, others state that this process is retarded, and a third group holds that it is first retarded but afterward accelerated. The truth probably is that the effects of alcohol vary in different individuals and in different conditions of the mucous membrane of the stomach, and further investigation of the subject is required before the indications for its use as a stomachic can be defined accurately. In all probability far more cases of gastric disorder are treated with alcohol than are really benefited by it, for it is to be remembered that the preparations of the bitter tonics which are most in vogue contain a high percentage of alcohol.

The question of the nutritive value of alcohol, which has occupied such a large place in the public mind recently, has been discussed by Dr. Benedict, a much more competent authority than I. I desire only to draw your attention to one or two points bearing on its usefulness as a food in diseased conditions. The first of these is that alcohol must be used in large quantities in order to be of any value as a food, for half a pint of whiskey is equivalent to some two ounces of fat. This amount of whiskey is, however, sufficient to cause marked cerebral symptoms, and the use of alcohol as a food in ordinary circumstances may therefore be dismissed from consideration. But in some cases, notably in high fever, it is found that much larger quantities can be borne without any symptoms of cerebral disturbance, and at the same time large draughts are being made on the resources of the body, and it is impossible to replenish these by ordinary means, for the fats and carbohydrates are not assimilated. Heroic measures are required in order to

maintain the integrity of the tissues, and alcohol may be taken into consideration as a readily available source of energy, even if not devoid of suspicion in ordinary circumstances. And it is a matter of common observation that a quantity of alcohol equivalent to the fats of the food in health induces no symptoms of intoxication in these cases, so that there would seem to be no reason to object to it as a nerve poison. But objections have been raised from another source, since it has been shown repeatedly that large quantities of alcohol predispose to infection, and some extremists have gone so far as to state that the recent results of Abbott, Laitinen and others condemn the use of alcohol in any dose and under any circumstances.

I do not wish to enter upon the division of the subject that has been assigned to my friend, Dr. Meltzer, but I should like to state that in all my experiments in which alcohol administered during the disease proved deleterious, the animals showed more or less distinct symptoms of intoxication, while in the cases with which I am dealing at present the patients show an extraordinary tolerance. I desire to speak guardedly on this question, but think that it is safe to state that while the food value of the small quantities of alcohol ordinarily tolerated is insignificant, in certain cases it is borne in quantities which materially aid in maintaining the resources of the body, and that there is no convincing evidence that when used for a short time in those cases it lessens the resistance to the invasion of disease.

As regards the use of alcohol as a narcotic, Laitinen's results with small quantities of alcohol (equivalent to 2 to 4 oz. of whiskey per day for an average man) given after infection do not indicate any distinct deleterious action except in those experiments in which animals were inoculated with tuberculosis, in which, as he states, it is impossible to measure the dose accurately. Besides, it is to be noted that the narcotic effects of alcohol could scarcely have the same

beneficial results in animals as are daily observed in patients, for the subjective effects of disease are entirely absent or only slightly developed in the former. It may be added that anæsthesia in any form reduces the resistance to infection also, and that if we are to exclude alcohol for this reason, we must logically abandon chloroform, ether and opium.

A danger in the therapeutic use of alcohol, which is generally recognized, is that of forming the habit. No one can deny that if this is of frequent occurrence, it is of itself sufficient to condemn all use of alcohol. But cases of chronic alcoholism arising from its medicinal use are fortunately rare and form an insignificant fraction of those arising from its social use. I can only wish that the medical fraternity were as guiltless in regard to other drug habits, such as that of morphin. There are conditions in which the prescription of alcohol must be guarded on this account,—notably in chronic diseases and as a stomachic,—but the most serious feature in regard to the use of alcohol, is that it is not sufficiently appreciated that it is a drug and ought to be used as one. At present it is too often advised merely as a matter of routine, very often at the suggestion of the patient or his friends, without consideration as to whether it is rationally indicated or whether experience has proved it of value in the conditions under treatment. I am strongly of opinion that this haphazard use of alcohol explains in large part the skepticism in regard to its value, and that if half as much consideration were given to its suitability to the condition as is given before most other drugs are prescribed, the position of alcohol in therapeutics would be more assured than it is, and a great gain would accrue from the more accurate definition of its sphere of usefulness.

In conclusion, I would sum up these remarks by saying that alcohol deserves a place in therapeutics as a narcotic, and to a less extent as a stomachic, and in certain conditions as a food. I would not disguise the fact that it has drawbacks,

like every other drug, but would plead that we must not allow ourselves to be guided entirely by consideration of any one of its properties, but must estimate in each case whether the sum total of its effects, good and evil, will benefit the condition.

ARTICLE XIII.

THE INFLUENCE OF ALCOHOL UPON INFECTION AND ITS USE IN THE TREATMENT OF ACUTE INFECTIOUS DISEASES.

By SAMUEL J. MELTZER, M.D.
OF NEW YORK CITY.

It is a very old idea that wine is a good thing for the sick and the infirm. "Drink no longer water, but use a little wine for thy stomach's sake and thine often infirmities," wrote a wise and holy man nearly nineteen hundred years ago. And a few centuries before him wine was ordered for patients by the greatest physician history knows to record. Through nearly twenty-four centuries, from Hippocrates down to our own days, physicians of all creeds and systems have employed alcoholic beverages as an aid in their struggle against diseases. Systems of medicine, however, influenced at all times the extent to which this therapeutic agent was employed; and as in the long history of the science of medicine numerous systems came and went, rose and fell, continual changes, rises and falls also mark the history of the employment of alcohol as a medicine. The influence of the systems, however, extended only to the degree, the extent to which alcohol was used; beyond and independent of any system there seems to have lived, and still lives in the minds of all observant practitioners a strong empirical conviction that some dose of alcohol "does the patient good." The task of each new theory was to provide the philosophers among

the physicians with arguments why alcohol should be given and how it affects the patient or the disease. The influence of the theory upon the practice seems to vary with the mental attitudes of the different civilized races: the more philosophical the mind of a nation is, the greater is the influence of a theory, for good or for evil. The so-called Brunonian system offers an instructive illustration. John Brown was an Englishman who lived in the eighteenth century. Influenced probably by a conception of irritability, as it was established by Haller, Brown brought forward the theory that life is kept up by stimuli, and diseases are either asthenic or sthenic; their cure, therefore, has to be either an increase or a decrease of stimulation. The employment of alcohol in sickness found in this theory the most promising explanation: alcohol is a stimulant. In Germany this theory was received with enthusiasm, and it had the unfortunate effect that physicians administered alcohol to their patients in very large, harmful doses. This abuse, says vonJaksch,[1] killed hundreds of patients. With the downfall of this theory a strong and long-lasting reaction set in against the abuse, as well as against the proper use of alcohol in diseases, and Binz[2] tells us that in the forties of the last century a physician had to defend himself publicly for giving moderate doses of alcohol to a typhoid patient.

In England, the home of Brown,—but also the home of the Baconian method of studying natural science by actual observation,—the Brunonian theory was never received with great enthusiasm, and exercised only a moderate influence upon the practice of using alcohol as a drug. And here the downfall of the theory did not produce such a reaction against the legitimate use of alcohol. On the contrary, already in the thirties and forties of the last century we see clinicians like Stokes, Graves, and especially Todd, exerting their influence to enlarge the indications for the employment of alcohol. It was the inauguration of that long period

during which in England alcohol was quite extensively used in febrile disease, and which is now apparently on its slow decline.

In the second half of the last century, with the advent of the experimental method in studying the sciences of medicine, alcohol became the subject of extensive experimental investigations, and it was especially in Germany that numerous experimental studies were published by Binz and his pupils and by many other prominent investigators, on the relations of alcohol to the temperature, the metabolism of the animal organism, the circulation, respiration, etc. Greatly through the influence of these scientific investigations alcohol again became a factor in therapeutics in that country. In the eighties and nineties of the last century we again find in Germany a greater enthusiasm for the use of alcohol in typhoid fever, pneumonia, puerperal fever, etc., than we meet with at the same period in England. Binz[3] summarized the reasons for giving alcohol in febrile diseases in the following manner: "Alcohol is an antipyretic, is a convenient food, and it stimulates the circulation and respiration." In addition to these points the recent progress in medicine brought out a new factor in the discussion of alcohol as a medicine.

Since the eighties of the last century most of the diseases for which alcohol was prescribed received a new character: they are now known as infectious diseases, and the question arose, what relation does alcohol have to infection? Clinicians like Runge and others, who are enthusiastic supporters of the use of alcohol in septic diseases, expressed their belief that alcohol strengthens the body in its struggle against the virulent invaders. Binz[4] says that "the opinion of our clinical teachers may in general terms be expressed as follows: Alcohol in large doses increases in an extraordinary manner the power of resistance to septic poison." Is this clinical opinion borne out by experiment?

Gentlemen, one of the theses with which I was entrusted to report to you to-day is on that subject, and reads as follows:

THE INFLUENCE OF ALCOHOL UPON INFECTION.

A consideration of the effects of its use upon immunity and upon the resistance capacity of the individual to septic infection.

EVIDENCE OF ANTITOXIC ACTION, IF ANY.

It is therefore the first task of my paper to offer a report on the experimental work done so far on the subjects in question.

Binz, in fortifying his above-mentioned opinion, quotes one experiment of his own. He injected into two dogs septic material taken from a decubitus of a typhoid patient. One dog received 10 cc. of alcohol three times within seventeen hours; this dog survived, the other dog died. Binz mentions this experiment in several places, but it does not appear that he made more than one experiment.

In attempting to produce cholera in animals, Koch tried first to introduce alcohol into their stomachs. This method was employed systematically by Doyen,[5] and he found that animals which received alcohol became indeed infected with cholera, while controls remained free. Doyen was inclined to believe that it was due to some local effect of the alcohol upon the acidity of the stomach.

Thomas[6] has given rabbits for two consecutive days about 5 cc. per kg. alcohol diluted four times with water, and then injected cholera cultures intravenously. Five alcoholized animals died, the control animals withstood infections with much larger doses. In one other experiment Thomas found that the serum of an alcoholized rabbit lost its bactericidal effect upon cholera organisms.

The first extensive series of experiments were made in this country by Dr. Abbott[7] of Philadelphia at the instigation of the Committee of Fifty on the Alcohol Question. Rabbits

were given alcohol 5 to 6 cc. per kg. per day before or after inoculation with either the streptococcus pyogenes, bacillus coli, or the staphylococcus pyogenes aureus. In the inoculations with streptococcus nearly all the alcoholized animals died, while most of the non-alcoholized survived. In the inoculations with the colon bacillus the alcoholized animals also showed a diminished resistance to the infection, although not so pronounced as in the inoculations with streptococcus. The inoculations with the staphylococcus did not bring out clear results.

Deléarde[8] has studied in rabbits the effect of alcohol upon immunization against rabies, tetanus, and anthrax. His conclusions are that in rabies the administration of alcohol after infection will destroy the required immunization, and that in tetanus and anthrax no immunization will take effect, if alcohol is given simultaneously. (Deléarde's statements make the impression of his having had only one experiment for each of his conclusions.)

Laitinen[9] studied the influence of alcohol upon the susceptibility to infectious material on 342 animals—dogs, rabbits, mice, guinea-pigs, chickens and pigeons. As infectious material he used anthrax, tubercle bacilli and diphtheria toxin. Alcohol was given either for a number of days previous to the infection, or started soon after. The quantity of alcohol used in these series of experiments was not less than 5 cc. per kg. per day; in many instances the animals were distinctly intoxicated. The anthrax experiments demonstrated unmistakably the deleterious effect of the alcohol. Most of the alcoholized animals died, most of the non-alcoholized animals survived the infection. The experiments with tubercle bacilli gave less striking results: In one series the alcoholized animals died after an average of thirty days, the non-alcoholized animals after thirty-four days, and in a second series the alcoholized animals died after an average of twenty and the non-alcoholized after an average of twenty-

two days. In the experiments with the diphtheria toxin the alcoholization hastened the death of inoculated animals. According to Laitinen the blood of the alcoholized animals seemed to show a decrease in its alkalinity; this suggestion was already thrown out by Abbott. (In a later publication,[10] the original of which was not accessible to me, Laitinen has studied the effect of smaller doses of alcohol. Of seventy-five alcoholized animals 61% died, and of seventy non-alcoholized animals 50% succumbed to the infection.) Laitinen credits Valagussa and Ranelleti[11] with the statement that alcoholized animals show a diminished susceptibility to the toxin of diphtheria.

Pawlowsky[12] has given whiskey to guinea-pigs for some time, and found that their resistance to infection with staphylococcus citreus was considerably diminished. He also states that the alcoholized animals reacted to a subcutaneous injection with a diffuse œdema, while in non-alcoholized animals an injection caused an abscess. (I would suggest here that this difference might perhaps have its explanation in the statement of Massart and Bordet,[13] that alcohol, even in great dilution. is negatively chemotactic.)

Gruber[14] and Koegler have administered to guinea-pigs small doses of alcohol (.1 to 1.5 cc. per kg.), and then infected them with the pneumobacillus of Friedlænder. They found that the alcoholization increased in general the mortality of the animals.

Goldberg[15] studied the influence of alcohol upon the natural immunity of pigeons to anthrax Of twelve pigeons which were inoculated with a certain amount of an agar culture of anthrax, all survived; of fifteen other pigeons which were inoculated with the same amount of anthrax, but which received soon after the inoculation, or a day or two later, comparatively large doses of alcohol, twelve died. The same occurred in another series in which alcohol was administered for some time previous to inoculation. In a third

series eighteen pigeons were inoculated with fatal doses of anthrax and one-half of this number received twice a day ½ cc. of alcohol. From the results in this series Goldberg concludes that the administration of alcohol did not prolong the life of the pigeons. (But it should be added that the results also demonstrated that the alcohol did not shorten the life of the animals.)

Ausems,[16] working under Talma, also found that the administration of alcohol in small doses to rabbits before infection, diminishes their resistance to different infections. Small doses of alcohol given after the infection reduce the temperature but do not influence the course or the severity of the infection. Large doses of alcohol reduce the temperature but increase the length and severity of the disease.

In contrast to this long list of experiments adverse to alcohol, I am able to record only one brief statement in favor of alcohol: according to Gruber,[14] an intraperitoneal injection into guinea-pigs of a freshly sterilized culture of prodigiosus, causes a strong collapse of the animal; the temperature sinks to 34° C., and death follows in a few hours. Now Gruber states in a provisional brief report, that the frequent administration of small doses of alcohol to such animals prolonged their life for many hours, and two animals were even restored to health.

Such is the report on the influence of alcohol upon infection. It unequivocally reads adverse to alcohol. Of the ten different systematic investigations none came out in favor of alcohol. It was studied on dogs, rabbits, guinea-pigs, mice, chickens and pigeons. The investigations extended to infections with cholera-vibrios, streptococcus, colon bacillus, anthrax, tetanus and tubercle bacillus, rabies and the toxin of diphtheria. In all these cases it was found that alcoholization before infection increases the susceptibility; alcoholization after infection decreases strikingly the resistance of the animal; it also destroys the natural and

the artificial immunity, and is rather favorable than antagonistic to the fatal influence of the toxin of diphtheria.

What do these experiments on animals teach us regarding the influence of alcohol upon infectious diseases in human beings?

Gentlemen, I venture to say that these experiments — striking as they may appear — teach us as yet very little new, and nearly nothing definite, and for the following reasons: In every one of these experiments in which the alcoholization proved to be definitely unfavorable, the smallest dose which was administered to the animals amounted to 5 cc. of absolute alcohol per kg. animal, and in many cases the dose was a good deal larger; for instance, 10 cc., and even more. For rabbits, the animal which was extensively employed, the fatal dose is — according to Dujardin & Baer[17] — 7.5 cc. per kg. Let us take the minimum dose of 5 cc. as a basis, and compound it for a human being of a medium weight of 75 per kg.: it would amount to 375 cc. absolute alcohol, or more than a pint and a half of strong brandy. Now who has ever given that quantity in a single dose, or even in two doses, to a patient? Surely this would lead in a normal individual to the most acute alcoholism, and perhaps even to a fatal issue. We would certainly expect, without any experimental evidence, that any infection in addition to such a toxic dose of alcohol will prove fatal. Furthermore, we also knew long ago that alcoholic individuals are less resistant to the effect of infectious diseases.

On the other hand, we have abundant proofs that similar, and even larger, doses of alcohol, distributed over twenty-four hours, administered to human beings down with infectious diseases, do positively not show such strikingly deleterious effects as were observed in animals. Abbott or Laitinen had in their respective experiments series of four or five alcoholized infected animals, all or the most of which

died, while the controls survived. Now Runge[18] published a table of twenty grave cases of puerperal fever with a recovery of 80%; all of these patients received for days and weeks very large doses of alcohol. If this does not prove anything else, it proves at least conclusively that large doses of alcohol are not as harmful to septic human beings as they seem to be to septic animals.

Observations of a similar kind have been made time and time again in typhoid fever. Between 1884 and 1887 I followed the custom of that time and treated typhoid cases with large doses of alcohol. I remember having given to a young girl of about 30 kg., nearly one pint of whiskey, every day for eleven consecutive days, without any untoward symptom. And it was during this period that I did not lose a single case of typhoid fever. Not that I wish to put up the claim that the alcohol treatment was the cause of the recoveries; I quote this experience to show that large doses of alcohol did not lower the resistance of my patients to their infection. Hundreds of other physicians had similar experiences. These experiences are reliable clinical evidences, sufficient to warrant the assertion that doses which proved so harmful to animals, are comparatively harmless when administered to human patients in a proper medical manner. These clinical observations seem to me to be well-established facts, equal in their reliability to those derived from the animal experimentation. I shall try, however, to offer some explanations for the differences in the results.

In the first place, as already indicated above, in nearly all the experiments the large quantities of alcohol were administered in one or two doses. In administering alcohol to patients we distribute the daily quantity in six or even twelve doses. By a single, large dose the body cells might become damaged beyond recovery. Then there are some other significant points. Take, for instance, the mode of administration: in most of the experiments the

alcohol was introduced into the stomach of the animal through a stomach tube. Abbott states that this method led in many cases to erosions and inflammation of the stomach, which in some cases resulted in distinctly complicating infections. Another significant fact is that in none of the experiments mention is made as to how the animals were fed; it is possible that the alcoholized animals had a good deal less appetite for food, and ate less than the control animals. We notice in many protocols the remark of the loss of weight of the alcoholized animals. The physician, as you all know, pays a great deal of attention to the feeding of his patient.

Furthermore, the reduction of the amount of alcohol per kilogram animal does not offer a basis for a fair comparison. The resistance of large animals is greater than that which is due to them on account of their number of kilograms. An animal of 75 kg. may resist a quantity of poison seventy-five times the dose which is fatal to an animal of 1 kg.

Moreover, as we know, even individuals of the same species vary considerably in their resistance to the effects of alcohol. There is surely a great difference in this regard between different species, and a per kilogram dose which is fatal to the pigeon might indeed be of no account to a man.

Finally, I would call attention to one fundamental difference between the experimental infections of animals and infectious diseases in man,—a difference which might have an important bearing upon the different results. In the experiments the infection or intoxication is brought on at once by a single injection of a nearly fatal dose of bacteria or toxins. The organism is taken by surprise before it could bring its defensive forces into action against the enemy. On the other hand, a disease is rather similar to a break within an immunization experiment. That main stage which we term disease is preceded by a slow invasion of bacteria or

their products before and during the long incubation time. When the patient and his doctor recognize the existence of an infectious disease, the struggle between the human organism and its virulent enemy is already well on the way for some time, and there are already at the disposal of the attacked body—besides the well-organized multitude of normal defensive forces—a good many newly formed immunization products, capable of taking care of a good many of the battle-worn invaders. Alcohol, therefore, might prove more harmful to the already greatly exhausted enemy in diseases than to the fresh, unrestricted virulent intruders in experimental infections.

However all this may be, we are bound to state that the large number of experiments on animals at present on record can at the utmost serve only as a warning to the practitioner to keep away from too large doses of alcohol in infectious diseases. They do not throw any light upon the question whether conservative doses of alcohol properly given to a patient sick with an infectious disease, and under proper management and care, are harmful, indifferent or useful. New experiments are required, with a proper consideration for the actual conditions existing in the infectious diseases of man.

I come now to the second thesis assigned to me for discussion. It reads as follows:

THE USE OF ALCOHOL IN THE TREATMENT OF THE ACUTE INFECTIOUS DISEASES, ESPECIALLY IN TYPHOID FEVER AND PNEUMONIA.

An explanation of the results obtained by its use in the light of our pharmacological knowledge of the drug.

Gentlemen, the use of alcohol in medicine is now on the defensive; it is again apparently passing through one of its historic crises. There are many causes for the present decline. Alcohol as a drug shares partly the fate of drugs in general, which are less prescribed at the present time in in-

fectious diseases than in previous years. The advent of serums also contributed to the decline in the use of alcohol. In diphtheria, for instance, antitoxin has greatly reduced the former extensive use of alcohol in this disease. Then the national and international movements against the abuse, as well as the general use, of alcohol in health has, no doubt, a good deal to do with much of the activity displayed against its employment in sickness. The most spirited attacks, however, which the use of alcohol as a medicine had to face have been made within the last year or two, and are based apparently on purely scientific grounds. The conclusions to which these writers arrive are simply sweeping, and read as follows :[19]

The bacteriological experiments, say the scientific opponents of alcohol, have demonstrated that alcohol favors infection. Alcohol is a proteid poison and not a food, proclaims Kassowitz, and some others agree with him. The newer school of pharmacology has proven, they say, that alcohol is not a stimulant but a depressant. Furthermore, alcohol is not a stomachic, is of no use as an antipyretic, and is a poor narcotic. In short, there is no earthly reason for its use in disease, and there are weighty reasons against its use there.

Permit me to discuss the validity of some of these arguments. Beginning with the question of the influence of alcohol upon infection, and the evidence to be derived from the existing bacteriological experiments, I shall refer to what I have already stated above, namely, these experiments as they stand now cannot be used as an argument against the employment of alcohol in infectious diseases in man, and we need not discuss this point over again.

The next important point in the discussion on the value of alcohol as a medicine is its supposed stimulating quality. It is chiefly for this effect that many physicians prescribe alcohol for their patients. The opponents of alcohol refer

us, however, to Schmiedeberg and his school, who hold that alcohol does not stimulate anything, but, on the contrary, exercises exclusively a depressing, paralyzing effect upon the functions of the body. It depresses the higher nerve centres, by which a degree of narcosis and a lack of concern is produced, and it causes paralysis of the vasomotor centres; in short, alcohol does not increase, but lowers, the vitality throughout the animal body. The so-called stimulating effect is simply a misinterpretation of the phenomena alcohol produces.

Gentlemen, in full appreciation of the high merits of Schmiedeberg and his learned followers, I venture to state that their theory suffers from some incompleteness in their analysis of the phenomena of stimulation and paralysis. We can all agree upon the proposition that stimulation has always the effect of increasing the display of a normal function, whatever this function may be; and that depression or paralysis invariably lowers or abolishes the normal display of a function. However, if the term "stimulation" has in pharmacology and medicine the same meaning which is attached to it in physiology, I cannot see why alcohol should not act as a stimulus. Any kind of a solution which is not isotonic with the body fluids will act as a stimulus on irritable tissue. Even cocain or other local anæsthetic will cause at first a stimulation of the tissues with which it comes in contact. The kind of an effect which such a stimulus might produce depends, of course, upon the nature of the tissue which it irritates. Application of alcohol to a motor nerve will cause contraction of a muscle; application to the peripheral end of the vagus will cause slowing of the heart beat; application to the chorda tympani will cause dilatation of the blood vessels of the submaxillary gland. Now, the slowing of the heart by stimulation of the vagus appears as a reduction of activity, the effect of the alcohol here is nevertheless not a depression, but a stimulation of a function, because it sets to work the inhibitory mechanism of the heart.

Now it is with regard to just this point that Schmiedeberg's theory shows a deficiency. This theory has in view only either an increase of motor or sensory activity, or a decrease of vitality, but it offers no room for stimulation of an inhibitory mechanism by which a certain activity might appear diminished and the vitality at the same time being actually increased. Let us take, for instance, the flushing and turgescence of the skin after the use of some dose of alcohol. Schmiedeberg considers it due to a paralysis of the vasomotor centre. I believe I will not meet with any contradiction from physiologists when I say that the flushing of the skin is due to either a stimulation of the vasodilators, or an inhibition of the tonus of the vasomotor centre; in either case it is the effect of stimulation of a normal function, and not a parlysis of a function.

It must be mentioned that Binz, too, who believes in the stimulating effect of alcohol, has in mind apparently only the motor phenomenon. He therefore insists that alcohol increases the number of heart beats under the supposition that a slowing of the heart would not be the effect of a stimulation. A practitioner would hardly appreciate the advantage of a stimulation which would increase the heart beats of a typhoid patient from 120 to 140 per minute. The observations of vonJaksch,[20] according to which alcohol reduces the pulse in fever patient, are surely more to the point: alcohol stimulates the inhibitory mechanism of the heart, and thereby reduces the number of its beats.

Before continuing the discussion on the relation of alcohol to inhibition, I wish to make a few remarks on the relations of alcohol to vasoconstriction and vasodilatation. The opponents of alcohol deny its stimulating effect upon the circulation, among others on the grounds that alcohol either causes a lowering of the blood pressure, or has no effect upon it; it surely does not increase the blood pressure. Permit me to say that actually there are very few reliable investi-

gations on the influence of alcohol upon the conditions of the blood vessels. The statement which is now frequently made without qualification, that the blood pressure is lowered by alcohol, actually refers only to ante mortem conditions in fatal doses. The writings of the opponents of alcohol are full of peculiar quotations. Paessler, for instance, is often quoted as saying that alcohol does not influence the blood pressure; what, however, he actually said, is that his method dose not permit the drawing of any conclusion regarding the effect of alcohol upon blood pressure.[21] Kobert[22] worked with isolated organs, that is with organs removed from all vasomotor influences; he is nevertheless quoted in support of the assertion that alcohol does not influence normal blood pressure. Although a further analysis of some of the writings might prove indeed interesting reading, I shall not indulge in it, but shall confine myself to the simple remark that to my knowledge there is nothing in the literature on the subject which can seriously disqualify the following considerations:

It is an established fact that after taking a moderate dose of alcohol the skin becomes turgescent and flushed. We have seen above that this is due to vasodilatation in the skin. This vasodilatation could be either local, confined to the skin only, or it could be a part of the general dilatation of all the blood vessels in the body. In this latter case there would be a lowering of the general blood pressure. For a decision of this alternative I would like to call attention to the following facts: The area which is controlled by the splanchnic nerves contains the largest part of the body's blood. When this area is dilated it withdraws a good deal of blood from all the peripheral organs. When this occurs the skin is cool, pale, cyanotic and sallow. When the skin is red and turgescent we can with safety assume that there is no general vasodilatation, no "bleeding into the vessels of the splanchnic area"; the vasodilatation in the skin is therefore only local.

But as the quantity of the body's blood remains constant, each local vasodilatation has to be compensated by a constriction of the blood vessels in another region. We know that there is a mutual nervous arrangement between the peripheral organs and the splanchnic area to such an effect that each vasodilatation of the peripheral organs is accompanied by a proportionate vasoconstriction in the splanchnic area. The administration of a dose of alcohol, which has the visible effect of causing redness and turgescence of the skin, has the actual effect of distributing the blood in such a manner as to cause vasodilatation in the peripheral organs, including the brain, and vasoconstriction in the splanchnic area. It is obvious that under these circumstances the blood pressure measured in the carotid artery, or in any other manner, will not be changed and will not indicate that a change in the distribution of the blood has taken place.

I maintain, therefore, that alcohol in not too large doses does not affect the general blood pressure, but effects some change in the distribution of the blood, which may be indifferent, or even harmful to a normal person, but which can prove to be of great importance to a patient with an infectious disease. We know through the investigations of Romberg and Paessler[23] that infections, with the pneumococcus, for instance, cause a general vasodilatation of central origin. The patient has then a "bleeding in the splanchnic area" and blood is withdrawn from all the peripheral organs: the skin, the extremities, the central nervous system, the heart, the kidneys, etc. Such a patient might have a high rectal temperature, but has cold extremities, livid skin, small pulse, mental depression (from cerebral anæmia), and voids very little concentrated urine. We give him alcohol and cause a degree of vasoconstriction in the splanchnic area and a vasodilatation in all the peripheral organs, with the result that the heart receives more blood and the pulse gets fuller, the extremities warmer, the skin gets red, becomes turges-

cent, dissipates more heat, thereby reducing the temperature; the patient's mind becomes brighter, and his urine is increased and less concentrated. In short, the patient is stimulated and feels better. This effect is surely a stimulation even in the restricted sense of the term in which it is used in the schools of Binz and Schmiedeberg. In other words, alcohol does not affect the circulation by increasing or decreasing the general blood pressure, but by instituting such a distribution of the blood which is especially favorable to patients sick with infectious diseases.

We return now to our discussion of the relations of alcohol to inhibitory mechanisms. The contention of Schmiedeberg and his school, that a great many of the symptoms caused by alcohol appear to be of a paralytic nature, is perfectly correct. The climax of them is the deep narcosis in acute alcoholism, which looks indeed like paralysis. There is, however, a cardinal difference between the temporary states of narcosis and states of paralysis which usually involve a permanent loss of some degree of vitality. And it seems proper to avoid the confusion of the two thoroughly different states. Whether narcosis could be looked upon as a state of inhibition is a suggestion I do not care to discuss here. However this may be, it seems to me to be quite certain that some of the lesser effects of alcohol upon the nervous system can be interpreted as inhibitory phenomena. We know that certain conditions of temperature or of electricity, or certain degrees of stimulation, or certain substances favor either excitation or inhibition. I should not attempt to discuss here this intricate subject, but shall state my hypothesis in a few words; it is this: Alcohol favors the irritability of the inhibitory mechanisms. I do not doubt in the least that alcohol stimulates also motor or sensory nerves, or the organs of activity in general. I only suggest that in a certain dilution and at a certain stage, alcohol, when in contact with the nerve cells, either directly stimulates preferably some of

the normal inhibitory mechanisms of the body or increases their irritability. As a consequence of this stimulation the perception for finer differences becomes decreased, the reaction time is prolonged, the formation of associations and the irradiation of stimuli within the central nervous system become restricted. Also the tonicity of all the muscles is reduced and the execution of motion is rendered difficult. While such changes are surely undesirable in health, they are very beneficial and desirable in sickness. The fever-burned, infected, septic patient with his restlessness, hypersensitiveness, turning and twisting in bed, soreness over all his body, subsultus, etc., is surely greatly benefited when by the administration of alcohol his muscles become relaxed, his sensitiveness diminished and his useless mental activity is restricted. Alcohol enlists the aid of the inhibitory mechanism to procure rest for the toxin-hunted patient.

Strychnin is a stimulant, and alcohol is a stimulant; but strychnin stimulates preferably the motor or active mechanisms, while alcohol stimulates preferably the inhibitory mechanisms. Too large a dose of strychnin causes convulsions, but too large a dose of alcohol causes what looks like paralysis. It is obvious that strychnin, camphor or caffein cannot supplant alcohol; but they might profitably supplement one another.

My defence for the use of alcohol in infectious disease consists in that (1) alcohol stimulates the patient by effecting a favorable distribution of the blood within his sick body; (2) alcohol protects the patient against harmful excitation by stimulating some of the normal inhibitory mechanism of the body.

As to the claim of the opponents of alcohol that it is a poison and not a food, I need not discuss it, as this point has been already well taken care of by an authority more competent to speak on that subject than I. All workers in that line of investigation seem to agree now more and more that al-

cohol, when taken for a longer period, proves to be in the end as good a proteid saver, as fat and carbohydrates are. Ott[24] reported very recently that this proposition holds good also for the administration of alcohol during a febrile disease. Believing as we do that alcohol is a very useful drug we should accept its additional quality as a food with special appreciation. Even if we restrict the administration of alcohol to such small doses as one cc. per kilo in twenty-four hours, it would present the value of 500 calories for an individual of average weight, which is about one-sixth of his daily need. Surely an addition not to be despised.

Alcohol as an antipyretic or as a stomachic we need not discuss here. They are at all events minor qualities, and will not, I believe, materially influence our decision one way or another regarding the use of alcohol.

Some of the radical opponents of alcohol admit its usefulness in states of collapse, but ascribe it to its narcotic effect. In collapse, they say, the patient is greatly alarmed by his condition, and the narcotic effect of the alcohol relieves him of his anxiety. But such effect could be better and more quickly accomplished by a whiff of chloroform:—would the advocates of this theory risk such a procedure? Patients in profound collapse have a vacant look in their eyes and hardly know what is going on around them. After being revived by some alcohol a look of recognition returns into their eyes, and they wish to know what happened to them. Can this be interpreted by assuming that the narcosis brought consciousness to the patient? Gruber's[25] guinea-pigs rallied from their profound collapse, brought on by the injection of prodigiosus cultures, by the administration of alcohol. Did the low temperature of the animals rise again because the narcotic effect relieved them of their anxiety?

But admitting even that the entire usefulness of alcohol rests upon its narcotic quality, as long as it is useful, why not use it? Here is the difference between opinion, based

upon "the light of pharmacological knowledge" and convictions based chiefly upon personal observation at the bedside. The attitude of Sir Samuel Wilkes[26] is an instructive instance. He professes his belief that alcohol is not a stimulant but a sedative, but advocates nevertheless its use in typhoid fever with arguments of the following character. He tells of a girl who was in the hospital suffering from a most severe attack of typhoid; she grew worse until her end seemed approaching. When apparently dying, brandy was administered, and this was continued for two days and nights until an enormous amount had been given. She then began to rally and shortly recovered. Now as regards the effects of this brandy upon her, "I can see," says Wilkes, "only three modes of reasoning: It did her good, it did her harm, it was valueless. Now I think few persons would say that giving two bottles of brandy in a few hours was of no importance, that its action on the system was *nil* and might be disregarded. It might then be said that it did harm, but in such a case as this there was only one step more to death, and this must have inevitably ensued had the patient got harm. The only alternative left is that it did good."

It is a noteworthy fact that among the opponents of alcohol there is not a single clinical man of note who came out unqualifiedly against the use of alcohol based simply upon unfavorable clinical results gathered at the bedside. On the contrary, clinicians ranking high in the profession and thoroughly familiar with the pharmacology of the drug are unwilling to be deprived of its aid in dealing with diseases like typhoid or pneumonia. Curschman,[27] writing on typhoid in Nothnagel's "Handbook," says that in spite of all theoretical objections alcohol is indispensable for the patient, and certain stages of the disease can not be successfully treated without it. He says further that the stimulating effect of alcohol upon circulation and respiration is a fact es-

tablished beyond all doubt, though it may be difficult to find its theoretical explanation. Pel,[28] in his well-known careful address on the treatment of pneumonia, says he is well aware that the theoretical explanation of the effects of alcohol is insufficient, but the experience at the bedside has the last word in this matter, and here we gain the conviction that alcohol stimulates and strengthens the patient. Juergensen, vonJaksch and many other celebrated clinicians express similar views.

Personally I am willing to be responsible for the following two statements: Alcohol in health is often a curse; alcohol in disease is mostly a blessing.

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ARTICLE XIV.

THE COMMON USE OF ALCOHOL AS A BEVERAGE.

By GRAHAM LUSK, PH.D.

OF NEW YORK CITY.

Wine has been used from the earliest dawn of history. Among the Hebrews its production is first attributed to the patriarch Noah, while among the Greeks and the Egyptians it was said to have been introduced by the gods, by Dionysis in Greece and by Osiris in Egypt. Among the older nationalities the vine and the olive were looked upon as the symbols of a cultured civilization. A semi-nomadic people could raise a corn crop, but a settled life and the highest husbandry were required of "him that planteth a vineyard."*

All races of men who can obtain alcohol use it as a beverage in one form or another. If alcoholic beverages be introduced among a nation unaccustomed to their use, much drunkenness follows. G. A. Reid, in a recent book on "Alcoholism," endeavors to show that the races long accustomed to the use of alcohol have lost through early extermination those individuals whose tendency was to drink themselves to death, and who have not, therefore, bequeathed this tendency to their offspring. Thus, a certain immunity is acquired. Scientific temperance would, therefore, mean free rum. This may be partially true, but Herbert Spencer has called our attention to the fact that drunkenness was very prevalent in England a hundred and fifty years ago,

* Encyclopedia Brittanica.

and that great changes have been wrought through an altered public opinion.

There are as many contradictory statements regarding the use of alcohol as a beverage as can be found in the literature of any one subject. On the one hand we find vonVoit* saying the flavor of wine occasionally taken is the noblest, delighting the human sense, and though it be not the milk of old age, still it makes the old feel young. On the other hand, Bunge rails at those who would partake of the excreta of yeast. Hutchinson† quotes Thackery's reported saying that he had got some of his best thoughts "when driving home from dinner with his skin full of wine," whereas Helmholtz, at the Commers given in honor of his seventieth birthday, declared that he had never had a great thought come to him after taking a glass of wine. Strümpell‡ declares that moderate drinking has a cumulative toxic action similar to lead poisoning.

The use of alcohol as a food has been known for a long time. But the general use of alcoholic beverages depends upon two specific properties: (1) Alcoholic drinks possess flavor, and (2) they act upon the central nervous system. A single glass of wine containing 10 cc. of alcohol may render a meal more palatable and bring about a certain amount of what is generally supposed to be central stimulation. In the absence of this flavor and stimulant, others are sought, as in tea and coffee, for example. Before the general use of tea, it is said that Queen Anne made her breakfasts of "beef steaks and small beer."

Alcoholic beverages are numerous and well known, and the custom of their use is varied.

A clear example of the use of beer as a flavor is found among the mountains of the Bavarian Tyrol. Here, excellent cheese is eaten with coarse bread, and the monotony of

* Hermann's Handbuch, 1881, No. 1, vol. vi, p. 430.
† Food and Dietetics, 1901, p. 327.
‡ Ueber die Alkoholfrage, 1898.

this highly nutritious combination of foodstuffs is varied with the light refreshing Bavarian beer. We can appreciate the motto which runs on the monkish brewery: "God bless the beer of Ammergau." It is interesting to note that where wine instead of beer is drunk the cooking also improves. With beer coarse food tastes well, but throughout the Rheinland the delicate *bouquet* of the wines compels a more careful attention to the flavor of the accompanying food.

The brilliant researches of Pawlow* have given us a clearer idea of the action of a flavor than we have heretofore possessed. Many will remember that Bidder and Schmidt found that the mere sight of food by a hungry dog resulted in the flow of gastric juice through his fistula. Pawlow has gone further in this direction. He has prepared a dog with both an œsophageal and gastric fistula. If such dogs be fed with meat or milk or bread, this "fictitious meal" passes out the opening in the neck, and five minutes after the beginning of such feeding a copious flow of gastric juice commences in the stomach. Pawlow was able to demonstrate that the pathway of the efferent impulses to the stomach was through the vagi. After cutting the vagi, this reflex secretion did not take place. Pawlow sought to find if the sensory stimulus for this apparent reflex flow of the gastric juice consisted simply in a local stimulus of the various sensory nerves of the mouth. To this end he prepared a dog with an œsophageal and a gastric fistula and washed the dog's mouth with such substances as hydrochloric acid, pepper, mustard and salt, or the dog was given stones to swallow, all with no avail. Not a drop of gastric juice flowed from the stomach. The dog could be made to swallow stones for hours at a time, passing them out of the fistulous opening of the œsophagus, but this mechanical stimulation had not the slightest reflex effect on the gastric glands. A piece of meat fed at any time during this experiment produces the flow of gastric

* Die Arbeit der Verdauungsdrüsen, 1898.

juice in almost exactly five minutes. This first secretion of gastric juice depends, then, upon the sense of the appetite, and, therefore, Pawlow describes it the "psychical secretion."

The physician in ordinary practice is too apt to think that whatever disagrees with him must of necessity disagree with his patients, forgetting thereby that what may be tasteless or repellant to him may be highly appetizing for them. Whatever stimulates the sense of appetite will aid in the preliminary "psychical secretion" of the gastric juice, and Pawlow himself describes his personal experience after an illness which left him apparently normal except that he was without appetite for his food, all substances tasting very much alike. When in this condition, he found that a glass of wine passing through his mouth, œsophagus and stomach produced sensations resulting in appetite. Wine would seem, therefore, the strongest stimulus to appetite and consequently the strongest stimulus to the flow of the psychical secretion of gastric juice.

Following the psychical flow of gastric juice, the further flow is brought about by chemical reagents, acting upon the neurosecretory apparatus. If egg albumin or bread be introduced into the stomach through the gastric fistula of a sleeping dog, there will be no secretion of gastric juice, for these substances do not contain the chemical bodies necessary for the stimulation of the gastric nerves, and mere mechanical irritation is always ineffective. On the other hand, meat or Liebig's extract of beef similarly introduced will slowly produce a flow, because meat contains substances which stimulate the neurosecreting mechanism. So also pepper, mustard, the amara, and alcohol* directly increase the flow of the gastric juice when introduced into the stomach. Rubner† states that he has noticed that alcohol helps the digestion when meat and fat are fed together.

* Brandl: Zeitschr. f. Biologie, 1892, Bd. xxix, p. 277.
† von Leyden's Handbuch der Ernährungstherapie, 1897, Bd. i, p. 108.

Pawlow explains this by showing that the quantity and enzymatic power of gastric juice produced by the fat meat diet is less than by meat alone. Hence game, which is comparatively free from fat, is given to invalids.

But alcohol seems to have a yet wider influence upon the gastric glands, in that it causes them to secrete when introduced into the small intestine,* or even into the rectum.† No other substance is known which will cause this effect.

We see clearly from the above that alcohol may act very generally throughout the whole intestinal canal, to stimulate the flow of the gastric juice.

The next question which arises is, does alcohol stimulate the flow of the pancreatic juice? Pawlow has told us that the great stimulus to the flow of pancreatic juice is the action of the hydrochloric acid of the gastric juice upon the wall of the duodenum. Hence we see that alcohol which promotes the gastric flow indirectly promotes the pancreatic flow as well.

Pawlow has compared the appetite to a lighted match starting a fire. The psychical secretion of gastric juice begins. Digestive products are formed which stimulate the stomach wall, directly causing a further flow of gastric juice, and finally the pancreatic juice is stimulated to flow by the presence of hydrochloric acid. White of egg introduced into the stomach directly will not be digested. White of egg eaten with appetite may be digested. Chittenden, Mendel and Jackson have shown that alcohol promotes the flow of saliva.

So throughout the intestinal canal alcohol favors the flow of the digestive juices.

It should be added that if too much alcohol be taken there is too great an irritation to the mucous membrane of the stomach, with increased activity and resulting dyspepsia.

* Chittenden, Mendel and Jackson: American Journal of Physiology, 1898, i, 164.

† Radzikowski: Pflüger's Archiv., 1901, Bd. lxxxiv, p. 513.

Also alcohol in the stomach at first prevents the gelatinization of proteid necessary for peptic digestion, but this factor lasts for a short time only, as the absorption of alcohol even from the stomach is rapid and complete.

There is little doubt that alcoholic beverages taken at meal-time promote digestion through the addition of a flavor. It is, however, very doubtful whether in normal persons continued excessive encouragement of the appetite is either necessary or desirable.

Besides giving flavor to the food, alcoholic beverages also act upon the central nervous system. Rubner says that could all men rest when tired, such stimulants as tea, coffee and alcohol might be less used. Two theories have been advanced to explain the action of alcohol on the central nervous system. The first is that alcohol stimulates and afterwards depresses the nerve centres. The second theory, championed by Schmiedeberg, is that alcohol always acts as a depressant, but that the beginning of the depression is first upon the inhibitory nerve centres, thereby leaving the motor apparatus freer to act. There is a diminution of the sense of fatigue, of attention, judgment and reflective thought, and a raising of the self-esteem. Alcohol brings cheer to the tired and to the weak. This factor should not be overlooked in its use in medicine.

The effect of alcohol in physical fatigue is a many-sided one. In considering this subject it must be remembered that there is a peripheral apparatus, the muscle, governed by neurones whose cell bodies lie in the anterior horn of the cord. The discharge of these cell bodies is in turn influenced (1) from the brain by both motor and inhibitory impulses; (2) from the sensory nerves within and near the muscle itself, and (3) from all kinds of sensory nerves from all parts of the body.

It is a widespread belief that fatigue is due to the exhaustion of nerve cells. This theory has been critically

reviewed by my assistant, Dr. R. S. Woodworth.* Dr. Woodworth shows that peripheral sensations, such as soreness, for example, are factors which naturally produce a feeling of fatigue and a consequent tendency to stop work, although in reality the nerve cells and the muscles are fully capable of continuing to act. If the narcotic effect of alcohol dulls these sensations of fatigue, work would seem easier.

It is known that many sensory stimuli entering the cord rouse the motor cells to increased irritability. Thus each sound of the rhythmical beat of a drum stimulates the cord cells that they may more readily discharge. In the same way Féré claims that the sensory stimulation of merely washing the mouth with brandy enables one to do more work.

One can only surmise concerning the direct effect of alcohol on the motor area of the brain or on the cord cells themselves.

Concerning the action of alcohol upon the muscle substance, important results have been communicated to me by my friend, Dr. F. S. Lee of Columbia University, and I am permitted to lay them before you here. Dr. Lee finds that in the curarized frog's muscle, where all the nervous influence is removed, the immediate effect of alcohol is to increase the amount of work done even by 100%. The individual muscle contraction is quicker and fatigue is delayed. The secondary effect, that is, the result after the action of alcohol has lasted for an hour, is directly the reverse of the above, there is a depression, a decreased ability to work. If it were possible to apply these experiments to protoplasm in general and to the nerve cells in particular, we would perhaps say that the action of alcohol was first to stimulate and then to depress.

It seems hardly necessary to refer to the fact that the use of alcohol in armies as a means of obtaining additional expenditure of physical force has long since been abandoned.

* New York University Bulletin of Medical Sciences, 1901, i, 133.

After taking alcohol the sum total of work done will not be increased, but rather diminished. The depressant effect is the predominating factor in the long run.

Where muscular work becomes of the minute, painstaking kind, the action of alcohol is not favorable for its accomplishment. Thus Aschaffenburg* found in the case of four typesetters that the effect of drinking 200 cc. of Greek wine containing 18% of alcohol was to reduce the speed of typesetting on an average of 15.2%, while it was noticed that the accuracy of typesetting was unaffected. vonVintschgau and Dietl † have measured the reaction time before and after drinking two bottles of Rhine wine. The reaction time was much delayed, although the persons thought that they were acting quicker than before..

Concerning the action of alcohol on intellectual activity, Smith ‡ has shown that 40 to 80 gm. of alcohol will depress the mental power, as indicated by the ability to memorize or to calculate, and it especially depresses the power to improve by practice.

Fürer § says that a mild intoxication results in intellectual depression lasting for twenty-four hours or more.

Without doubt alcohol reduces the power to do both physical and mental work. It reduces the power to learn. All the mental work done in the above experiments was of the minute, painstaking sort. Dr. Woodworth has suggested to me that intellectual activity with some swing and freedom about it and aiming only at broad effects might be differently influenced, as seems indeed to be the case with some orators, musicians, and possibly writers.

On the whole, the moderate use of alcohol as a beverage gives additional flavor to the food, and acts as a mild narcotic, often preceded by a period of exhilaration.

* Kræpelin's Psychologische Arbeiten, 1896, i. 608.
† Pflügers Archiv., 1877, Bd. xvi, p. 316.
‡ Archiv. f. Psych., 1895, Bd. xxvii, p. 958.
§ Archiv. f. Psych., 1895, Bd. xxvii, p. 970.

ARTICLES XV.-XIX.

HEAD INJURIES.

NON-OPERATIVE HEAD INJURIES.

By THOMAS J. ROBINSON, M.D.
OF TAUNTON.

INDICATIONS FOR OPERATION IN HEAD INJURIES.

By EDWIN W. DWIGHT, M.D.
OF BOSTON.

INDICATIONS FOR OPERATION ON HEAD INJURIES.

By WILLIAM N. BULLARD, M.D.
OF BOSTON.

GUNSHOT WOUNDS OF THE HEAD AND CRANIUM.

By LOUIS A. LaGARDE,
MAJOR AND SURGEON U. S. ARMY.

TECHNIQUE AND AFTER-CARE OF OPERATIONS UPON THE CRANIUM.

By CHARLES L. SCUDDER, M.D.
OF BOSTON.

READ JUNE 10, 1902.

ARTICLE XV.

NON-OPERATIVE HEAD INJURIES.

By THOMAS J. ROBINSON, M.D.,
OF TAUNTON.

First, just what is meant by non-operative? The term as used here simply means injuries in which no operation on the skull or its contents is advisable.

These cases include injuries to the scalp; certain injuries to the skull; certain injuries to the brain; very often a combination of all three.

Classified, they come under the following heads: Injuries to the scalp; certain forms of vertex fractures; fractures of the base; cerebral concussion and contusion; certain cases of compression; certain cases of laceration.

INJURIES TO THE SCALP.

The only question of diagnosis in contusion of the scalp is in reference to fractures. Effusion of blood beneath the aponeurosis may often be extensive, and sometimes the margin of the effusion may have such a raised, hard feel that it is difficult to rule out a depressed fracture. Here, when the diagnosis is doubtful, it is best to make an open incision.

These injuries are treated simply by cold applications and a suitable compression bandage. If there is a large hematoma which absorbs very slowly time will be saved by making an incision and turning out the clot.

The diagnosis of scalp wounds is of course obvious. Here in addition to the general canons of wound treatment

there are certain special points to be observed, namely, careful hemostasis; the strictest antisepsis; removal of all bruised tissues or those whose vitality is at all questionable, and finally the use of drainage if there is any chance for retention of fluids.

NON-OPERATIVE FRACTURES.

Of vertex fractures simple linear fractures only can be considered in this class; all comminuted, depressed or compound fractures call for operation.

The diagnosis of simple linear fracture is not always easy, especially where there is no wound of the soft parts. Often the point of injury is covered by a thick hematoma through which very little can be felt. Here it is often well to incise the parts and feel the exact condition; this should always be done if there is reason to suspect a depression.

Where there is an open wound the parts can be inspected and the diagnosis is simple. With the eye and finger search carefully for fissures or depressions; do not mistake sutures or Wormian bones for fractures. The important thing is to allow no depressed fracture to pass for a linear fracture, as the whole treatment of the case depends on this point.

The treatment of these cases is simple and expectant: Due attention to any injuries of the soft parts; rest, cold applications to the head, laxatives and diuretics if necessary, and care in the general nursing. If subsequent to the injury signs of compression develop, they are probably due to meningeal hemorrhage, and call for immediate operation.

FRACTURES OF THE BASE.

The vast majority of fractures of the base of the skull come in the category of non-operative cases, this chiefly from anatomical reasons. The base of the skull, except in certain special places, is not accessible to operation. A

class of cases to be excepted from this rule, however, are those of fracture of the anterior fossa; these cases, concerning chiefly the orbital plate, are treated on the same lines as vertex fractures, and will not be considered here.

The diagnosis of basal fractures rests upon three cardinal signs: (1) The appearance of ecchymoses beneath the skin or mucous membranes, due to spread of blood from the seat of fracture; (2) the escape of blood, serum or brain substance from the cavities of the skull; (3) disturbance of function along particular cranial nerves.

Regarding ecchymoses these may be early or late, beneath the skin, the conjunctivæ or the covering of the pharynx. The location corresponds to the region of fracture; ecchymosis of the eye points to the anterior fossa, of the mastoid to the middle or posterior fossa, of the cervical region to the posterior fossa. This last appears only after a few days.

As regards the escape of blood from the skull, bleeding from the ear is the most common; here be sure that the blood comes from the inner ear and not from some wound of the meatus or tympanum. Profuse hemorrhage comes only from fracture.

Escape of serum usually occurs after hemorrhage, though it may begin at once. A free and continuous discharge of serum from the ear, beginning soon after injury, is pathognomonic of basal fracture extending through the petrous bone into the subarachnoid spaces; sometimes when the tympanum is not ruptured the fluid, instead of escaping by the ear, runs down the Eustachian tube into the pharynx.

The escape of brain substance is rare and indicative of extensive and fatal injury.

In addition to these special symptoms there will be in almost all cases brain symptoms of contusion or compression in varying degree, all of which are to be considered in determining the diagnosis.

The treatment is expectant and symptomatic. As the

cases are generally the result of extreme violence and are complicated with serious brain lesions, treatment is often of no avail, and all injured parts should be cleaned as thoroughly as possible; the ear, if injured, should be wiped out and kept plugged with sterile cotton; these means to prevent infection of the external parts and its subsequent spread into the brain: complete rest; cold to the head; extreme care in feeding and regarding bed-sores; attention to bowels and bladder. If later in the case symptoms of compression from hemorrhage or pus appear, operation may be required, provided it is likely that the cause of the compression can be located and removed.

CEREBRAL CONCUSSION AND CONTUSION.

In considering the diagnosis of these conditions, the history of the case is important with reference to the question of injury. If, after an injury to the head, we have quickly loss of consciousness, partial or complete, pallor, disturbances of vision and hearing, loss of muscular power, weak pulse and respiration, perhaps vomiting, we have a typical picture of what is called concussion, a condition which is perhaps best regarded as one of brain shock. The mild cases of concussion differ from the severe simply in degree, the effects of the former being quickly over, those of latter more lasting.

If the condition of cerebral shock just described is persistent, the coma profound and lasting, the pupils dilated and insensible to light, or, if, with reaction of the pulse and respiration, evidences of muscular paralysis or spasm appear, the case is not one of concussion but of contusion. Cases of concussion and contusion shade into each other and the only means of differentiation is the severity and persistence of the symptoms.

In cases without history the chief difficulty in diagnosis is in differentiating between head injuries and cases of coma due to other causes, namely, opium, alcohol, apoplexy, uræmia and diabetes.

In opium poisoning the contracted pupils and very slow respiration will usually mark the case. More difficult is the separation from alcoholism, because head injuries occur so often when persons have been drinking. Absence of alcoholic smell is of positive value, its presence not. In alcoholism the coma is not quite so deep, and temperature is usually subnormal, whereas in severe central cases the coma is absolute, the temperature elevated.

In apoplexy there is as a rule evidence of paralysis either of face or extremities, also a normal or subnormal temperature.

In uræmia there is usually œdema of some part of the body and the urine shows characteristic changes.

In diabetic coma the urine will tell the tale. Therefore, examine the urine carefully in all these cases when it is possible. Consider all the symptoms carefully, and if in doubt wait; time will clear the matter up. Especially, beware of mistaking a cerebral lesion for alcoholism.

TREATMENT OF CONCUSSION AND CONTUSION.

For concussion the treatment is simply that of shock. Rest in bed with the head low; absolute quiet; heat to the body and extremities; stimulants, best strychnin subcutaneously; attention to scalp wounds, if necessary.

For contusion the foregoing; also cold applications to the head. Particular attention should be paid to the excretions for the prevention of auto-intoxication. In cases where swallowing is difficult great care should be used in feeding, as then cases are very prone to pulmonary complications; also, the greatest pains should be taken to prevent bed sores. After the acute symptoms have subsided, if persistent mental and motor changes remain, iodide of potass is said to be of service.

CEREBRAL COMPRESSION.

In many cases of cerebral compression it is very difficult to draw the line between the operative and the non-operative

cases. The general rule, "Operate if it is probable that you can find and remove the compressing cause," is simple in theory but complicated in practice.

Traumatic compression may be produced in several ways: (1) By extravasation of blood; (2) by depressed fractures; (3) by œdema from circulatory changes. The symtoms of general compression are the same whatever the cause. These are mental disturbances; headache; muscular disturbances; then stupor, deepening into profound coma, slow pulse and respiration, pupils dilated and sometimes unequal; elevation of temperature; choked disc; sometimes convulsions. The symptoms of local pressure are various paralyses; hemiplegia, monoplegia or paralyses of different muscle groups, according to the location of the compressing cause.

CASES OF COMPRESSION FROM HEMORRHAGE.

The majority of these cases are due to rupture of the middle meningeal artery or its branches; these are operative and do not concern us here.

On the other hand, most cases of cortical or subdural hemorrhage are non-operative unless the clot is very large where the indications are the same as in meningeal hemorrhage. These cortical cases commonly show a mild grade of pressure symptoms; some mental uncertainty, sleepiness, and slowing of the pulse; often headache and loss of memory.

Compression from depressed fracture is operative. Pressure from œdema of the brain is almost always non-operative. Here the diagnosis is generally conjectural and the symptoms those of general compression without localizing signs.

Aside from operation, treatment of these cases is general and on the lines already laid down.

In cerebral œdema venesection may be of benefit by relieving the venous circulation; also cold to the head to contract the arteries; free purgation and diuresis to promote absorption and excretion.

CEREBRAL LACERATIONS.

Lacerations of the brain substance are usually the result of extreme violence and generally complicated by other factors, such as depressed fractures or hemorrhage. The symptoms are not characteristic, being practically those of contusion, or if the laceration is accompanied by hemorrhage we may have the symptoms of compression. It is often impossible at the time of injury to differentiate between cases of laceration and contusion. Fortunately, the diagnosis is of little practical importance. Later, the case may develop paralysis or contracture of various muscle groups; also albuminuria or glycosuria, bulbar paralysis or various disturbances of the special senses. Results such as these following brain injury would point to a laceration.

The only rule for separating the operative from the non-operative is here the same as in other cerebral injuries; if you can locate the lesion and help it, operate; otherwise do not. In other words, without localizing symptoms, treat the case expectantly.

Treatment is the same as for contusion.

In conclusion, let me urge the importance of two things in the treatment of all non-operative head cases: (1) Extreme and immediate care in the antiseptic treatment of all wounds and abrasions of the soft parts of whatever degree; (2) extreme care in the feeding and general nursing. By attention to these points can septic and pulmonary complications be best avoided, and the patient given his best chance.

ARTICLE XVI.

INDICATIONS FOR OPERATION IN HEAD INJURIES.

By EDWIN W. DWIGHT, M.D.
OF BOSTON.

For many reasons it is impossible to treat satisfactorily and thoroughly a subject of such magnitude within the limits that are of necessity set for the papers read at our annual meetings. It is particularly difficult in this case because we have to deal with a subject with which we are all more or less familiar, and as to the details of which probably no two of us entirely agree. The number of head injuries occurring in every practice is considerable; the number appearing at a large hospital is very great. The literature on the subject is extensive and unsatisfactory, and so much at variance that it will be impossible to cover the ground, and perhaps to arrive at any satistactory conclusions, without spending much more time than is at our command.

I shall content myself with drawing certain conclusions from my own experience, and from a study of some 650 cases in which a fracture of the skull was demonstrated, either by autopsy or operation. It will be impossible to give you all the figures upon which these statements are based, and therefore I shall draw conclusions and state as facts matters which, although not generally accepted, are, I believe, proved to be facts by these figures. In approaching so indefinite a subject as head injuries, and one

upon which opinions differ so widely, it is wise, I think, for us to consider for a moment, (1) what they are, (2) what operations are available for their relief, and (3) what evidences may be discovered on external examination demonstrating a condition which would justify operation.

When we speak of head injuries it is generally understood that we mean injuries affecting the brain, or such injuries as may appear to affect the brain. The brain being protected from injury by a firm, elastic covering, is not affected by slight blows which might cause injuries to other tissues. The skull, however, is exposed to violence in many forms, and injuries to it are very common. Injuries to the brain itself must occur either after a fracture of the skull or as a result of sufficient force applied to it to thoroughly jar and lacerate its contents without injuring the skull itself. On account of the form of the skull, fractures do not cause many symptoms and are not in themselves dangerous to life, the danger coming in all cases from injury to, or pressure upon, the brain.

The brain may be injured by tearing by foreign bodies, by detached or depressed portions of the skull or by hemorrhage into its substance; or it may be sufficiently compressed to cause death or serious symptoms by depressed fragments of bone, foreign bodies or hemorrhage into its substance or onto its surface. Operations in cases of injury to the brain are performed to remove foreign bodies or relieve pressure, and it is only when we have reason to believe that foreign bodies or pressure are present that an operation is justified.

Operations for the relief of intracranial pressure or injury are usually spoken of under the general head of trephining, but this term should be used in the same sense as "laparotomy" or "abdominal section." It should be clearly understood that trephining is simply making an incision which allows us to reach the tissues requiring relief or

treatment. An opening through the skull may be made in several ways, most commonly by means of some form of circular trephine, by burr drills or by the use of mallet and chisel or gouge. In the last few years we have heard a great deal of the advantage of the latter methods, the necessity for some change being based on the idea that the use of the ordinary circular trephine requires great exertion and a long time, and on account of the possibility of injury being done to the brain. In the hands of aurists, or others specially trained in the use of the mallet and gouge, it is probably possible to make an opening through the skull with speed, comfort to the operator and safety to the patient, but in the hands of a general surgical practitioner the use of a trephine is much more rapid, surer and safer.

A trephine opening through the average skull should be made within two minutes from the beginning of the scalp incision. I have repeatedly made it in a minute and a quarter, and have on several occasions timed my assistants, they usually taking about two minutes, never over two and a half. Neither is there any serious danger of injuring the brain. The dura may be opened, but this, I believe, is of no serious importance. The opening, made by a one-inch trephine, is sufficiently large to determine the presence of blood clot, serum or pressure from other causes. It is also sufficient to allow the elevation of depressed fractures and the removal of considerable amounts of clotted blood. Such an opening will begin to decrease in size within a comparatively short time, and within a year the brain is fairly well protected. If, for any reason it is necessary to enlarge this opening, it can be rapidly and satisfactorily done with a properly formed and sufficiently powerful rongeur. The operation itself is not associated with any appreciable amount of shock, neither does it require much anæsthetic, and consuming so little time does not in itself diminish the patient's chance of recovery. For this reason

I consider it a perfectly justifiable exploratory operation in cases where the condition inside the skull is in doubt, and do not hesitate to use it as such with greater freedom than exploratory laparotomy.

The 650 cases which have been referred to, and a study of which has confirmed my opinion in regard to many points in connection with head injuries, are drawn from the following sources: Two hundred from the literature of the past five years; 300 taken from the records of the Boston City Hospital; and 150 autopsies occurring in the practice of Dr. F. W. Draper as medical examiner. These are all consecutive cases in which fractures of the skull were found at autopsy or operation.

The symptoms and external appearances found in cases of injury to the brain may be divided into two classes: (1) Those which show interference with the function of the brain, such as paralysis and condition of consciousness, and (2) those which are the result of injury to the skull, such as external hemorrhage and ecchymoses. As has already been said, injury to the brain not infrequently occurs without fracture of the skull. In such cases operation must depend on the signs presented of interference with the brain itself. In the much more common class, where a fracture of the skull also exists, both varieties of symptoms may be presented for consideration.

FRACTURES OF THE SKULL.

Taking the whole number of fractures of the skull we find that 40% of them were depressed, this number being somewhat larger than probably occurs in fact. Localized, depressed fractures are extremely rare, but 3½% of the whole number were of this character. In every other case there was a fissure extending into the base. Localized fissures of the skull are still more rare, something over 1½% only being of this type. The base is involved in 95% of all

fractures. As it is very generally accepted that depressed areas of bone should be elevated I shall not further consider depressed fractures.

Fissures extending from some portion of the vault into the base may involve one, two or all three fossæ. In 55% one fossa was affected, in 36% two, and in 6% all three. The anterior fossa was involved in 42%, the middle fossa in 82%, and the posterior fossa in 25%. By far the most common fracture is one beginning in some portion of the parietal bone, a fissure extending either along or across the middle meningeal grooves, and ending in one of the foramina. When the fracture is a depressed one its location may usually be recognized, but when, as is more commonly the case, there is only a fissure, we must depend upon less definite evidences, the most important being external hemorrhages from the ear, nose or mouth, or hemorrhage under the scalp or about the eyes. If in the form of a fissure, injury to the bone itself does little harm, and rarely gives rise to any symptoms, those we do find simply depending upon the external appearance of hemorrhage from within.

When a well-defined hemorrhage under the scalp or into the back of the orbit occurs after an accident where violence has not been directly applied to the point of hemorrhage, it may be accepted as positive evidence that a fracture exists near that point. When hemorrhage occurs from one or both ears the probabilities are in favor of a fracture on the side from which the hemorrhage comes. In 67% of these cases in which there was a hemorrhage from one ear a fracture of the middle fossa on that side was found. Hemorrhage from the nose is of much less importance. In only 22% with bleeding from the nose where violence had been applied elsewhere was there found a fracture of the anterior fossa. When such external hemorrhages are absent it must not be assumed that there was no fracture through the adjoining fossa, as in 31% of fractures of the middle fossa no hemor-

rhage from the ear was found, and in 30% of all fractures there was no hemorrhage of any kind. The diagnosis of a fracture in the skull depends upon its discovery by touch or the presence of one of the forms of external hemorrhage, and when so large a number is found in which a fracture exists without either of these manifestations it must frequently be impossible to be sure of their presence if they do exist.

The diagnosis of injury to the brain usually depends upon the condition of consciousness, condition of the pupils and pulse, and the presence or absence of some form of paralysis. In those cases in which there is a decided variation from the normal in one or more of these several conditions, it is usually safe to say that there is some form of interference with the function of the brain. Unfortunately, for the ease of diagnosis, in a very large proportion of cases there is no change from the normal, and when such a change does exist, while it may show the presence of some intracranial disturbance, it does not help us materially in deciding just what has gone on within the skull.

The condition of consciousness is one upon which much stress is laid, and very false ideas seem to be common as to the importance of a condition of coma, either progressive or otherwise, in deciding the question of operation. Profound and absolute unconsciousness is extremely rare in cases of head injury, in but 5% of cases is it present, and then more commonly when the injury is in the ventricles or basal ganglia. The percentage of cases in which the individual is thoroughly conscious is also small,—about 11%. Most common are those which have varying degrees of consciousness and restlessness, and it is among these that the thoroughly operable cases are found, and most mistakes are made. It is very common to have that condition described as alcoholic stupor or alcoholic delirium, and as many of our hospital cases that have received an injury to the head have an alcoholic breath, the diagnosis of alcohol is very frequently made.

The condition of the pupils may be of assistance in deciding the question of operation, but unfortunately the number is very large in which marked intracranial disturbance exists without any characteristic change in the pupils. The Hutchinsonian pupil, that is, dilated on the same side as the hemorrhage and contracted on the opposite side, is frequently spoken of as of importance in the diagnosis of extradural hemorrhage. I do not find that it is more common when the hemorrhage is extradural than when it is subdural or into the substance. When it does occur it is a fairly accurate test as to which side the hemorrhage is on, but it tells us nothing otherwise as to its location, and it is only found in 10% of all cases. I find, in a general way, that when a single pupil is dilated the hemorrhage is on the same side in 70%, on the opposite side in 30% ; and when a single pupil is contracted the hemorrhage is on the same side in 30%, on the opposite side in 70%.

The character of the pulse has a certain value, but has not nearly that with which it is ordinarily credited. Normal and rapid pulses are not at all rare in cases of more or less extreme cerebral pressure, and when these conditions are present they tell us very little as to the character of the cerebral injury. The pulse was found to be slow in something over 40% of all cases and to have the bounding character in 27%. When it is slow, or slow and bounding, the chances are largely in favor of an extradural hemorrhage, 90% of all slow pulses in this list of cases being associated with extradural hemorrhage.

When a definite paralysis is present, it must be accepted as one of the most valuable signs that we have as to the portion of the brain that is affected. It shows very little, however, as to the character of the hemorrhage or injury. If we can judge anything by the figures at our command, paralysis is much more common in the cases in which the brain is injured than in purely extradural or subdural

hemorrhages, and it is most rare in the extradural. In the majority of cases of extradural hemorrhage of slow onset paralysis does not occur. Where it is found within a short time after the accident, we may assume that there is either a hemorrhage into the substance or laceration in the region of the centre affected. Paralyses appearing later are more apt to be due to pressure alone.

The presence or absence of the various reflexes is supposed to be of some importance in deciding the question of cerebral injury. From a study of these cases it has been impossible to arrive at any definite conclusions. It has, however, been noticed that the diminution or absence of reflexes was almost, if not quite, constantly associated with profound degrees of unconsciousness, coming on promptly after the injury, and so would appear to have comparatively little value, unless it is to indicate a considerable degree of injury to the more important structures of the brain.

The decision as to operation in doubtful cases is not materially helped by the presence or absence of all or any set of symptoms. The presence of definite, localizing symptoms, especially those such as coma and paralysis, point toward hemorrhage into, or injury to, the brain substance, and are not usually found in those cases which will most probably be relieved by operation. Those cases that are most distinctly operable, that is, extradural or subdural hemorrhages limited to one side, are not usually associated with definite symptoms.

Personal experience, and a study of all the cases that are available, have apparently demonstrated that the symptoms presented in the majority of cases of injury to the brain are ill defined and not such as we might expect from a study of the literature; that they are best defined in those cases that are least apt to be benefited by operation; that in the vast majority of all cases of injury to the brain, and especially in those such as one-sided extradural or subdural

hemorrhages, where an operation may be expected to give relief, the symptoms are indefinite and may be entirely wanting.

In distinctly operable cases, which include about 40% of all deaths associated with fracture of the skull, we usually find at autopsy a fissure beginning in the vault and running into or through the middle fossa, death being due to pressure from extradural or subdural clot. These cases may or may not be associated with varying degrees of cerebral laceration. A careful study of the symptoms in such cases will show that there probably was good reason to suspect some form of intracranial disturbance, but little, if any, definite proof.

Of the fracture itself we may have some definite sign, either of depression or that a crack exists from which a deep hemorrhage appears. If such a hemorrhage exists, either in the ear, nose, under the scalp or in the post-orbital space, it is safe to assume that a fracture will be found in that region. In a very large number of cases we simply find indefinite signs of cerebral disturbance without any localizing symptoms, either of fracture or injury to the brain. In these cases it is my habit to do an exploratory trephining, and a very large proportion of them are found to be those which most definitely require operation.

In the dim light afforded by these facts I lay down the following rules: Given positive signs of intracranial disturbance following an accident which might well cause such a condition, but without definite signs of fracture, I should explore. Given a case in which there is probable evidence of fracture, and a probability of interference with the brain, I should operate.

I have never seen fatal or serious results follow trephining by skilful hands, even when two or three openings in the skull were made, and I have seen many lives saved by exploratory operations in this very large class of doubtful head injuries.

ARTICLE XVII.

INDICATIONS FOR OPERATION ON HEAD INJURIES.

By WILLIAM N. BULLARD, M.D.
OF BOSTON.

Previous to the introduction of antiseptic surgery, and indeed until within the last twenty years, the only conditions which were generally believed to call for operative interference in head injuries were compound depressed or compound comminuted fractures of the cranium.

With the general use of antisepsis and, later, asepsis, the comparative safety of operations was immensely increased, and it became natural to inquire whether operations could not be undertaken with benefit in other forms of head injury.

The general interest taken in the later eighties and early nineties in brain surgery, and the greater frequency of operations on the brain, drew attention to the fact, which was contrary to the preconceived views of the time, that under aseptic conditions the meninges and the brain could be incised, punctured and manipulated with comparative impunity. I shall never forget how, in one of the earliest cerebral operations in which I was professionally interested, I saw one of our best-known surgeons plunge a bistoury into the optic thalamus, and the mental relief when no symptoms whatever followed.

The comparative safety of simple incisions of the brain being proved, there was still much discussion in regard to

the dangers of interference with the meninges, and many physicians and surgeons were convinced of the serious results likely to follow upon an incision or a laceration of the meninges. In consequence of this opinion many operations were only partially performed, the meninges being left intact after the trephining, and the results being thus impaired. The question of the safety of incision of the meninges, and whether such procedure increases the severity of the operation and endangers the recovery of the patient, has now in my opinion been definitely settled. Aseptic incision of the meninges is not in itself dangerous or even very serious. It is imperative in many cases of brain injury if the full benefit of the operation is to be obtained.

What are, in the present state of our knowledge, the indications for operation in head injuries? Opinions differ somewhat in this matter. Some surgeons go so far as to advocate operation in all cases of fracture of the cranium, and in many cases of prolonged unconsciousness following injury to the head. Others are more conservative, and would advise operation only in those cases where it is obviously and imperatively demanded.

In answer to this question I shall consider the more common signs and symptoms of head injury in detail, and discuss the value of each by itself and in combination with others.

FRACTURE OF THE CRANIUM.

I. How far is fracture of the cranium in itself an indication for operation? This depends on the character of the fracture, on its position and on the age of the patient. I will speak only of fractures of the *adult* cranium.

Compound depressed and compound comminuted fractures should be operated upon in practically all cases. (This, of course, presupposes, as we do throughout this paper, the presence of suitable conditions for operating and

asepsis.) All punctured or perforating fractures come under this class. I believe that in all bullet wounds of the skull from the outside, that is, not through the mouth, nose or ears, or through the base of the skull, where there would be excessive difficulty in reaching the opening, the bone around the bullet wound should be trephined, not for the sake of finding the bullet, but simply for the purpose of cleansing the wound, as far as may be, and allowing no secretions to collect about the meninges or between them and the bone. In compound fractures of the cranium where there is no depression and where only a single fissure is found, it is safer to operate (trephine) even though there be no other symptoms.

Simple fractures. — What shall we do in cases of simple fracture without symptoms? This is the class of cases about which opinions differ most strongly. I believe that on the whole it is wiser and better in these cases to be conservative and not to operate, but the patient should be kept under careful observation and operation be undertaken at once if any indication presents itself. Investigations on the results of simple fracture of the cranium show that only in rare cases are they serious, or such as could have been relieved by operation. I wish here to emphasize certain facts. Intracranial complications may arise with any severe head injury. Deep cerebral hemorrhages, single or multiple, may exist. We may have single hemorrhages situated in the basal ganglia or in other inaccessible parts of the brain, or we may have numerous minute or microscopic hemorrhages scattered throughout the brain substance. Neither of these conditions are operable, and their symptoms and results are not to be confused with those of simple fracture. Again, in all cases of severe blow upon the head, and probably in practically all cases of fracture of the skull, there is more or less contusion of the brain. This is apt to be on the opposite side from the direct blow. It is prob-

ably often the cause of certain disquieting symptoms, and its presence must not be forgotten.

The later conditions resultant from the fracture itself in cases of simple fracture of the cranium are not usually marked. If in any given case epilepsy should occur after an injury producing simple fracture of an ordinary character, an exploratory trephining should be resorted to at once after the first attack, but such condition is rare (or absent) in cases of simple fracture without concomitant symptoms of pain, unconsciousness or fever.

LOSS OF CONSCIOUSNESS.

II. The value of loss of consciousness as an indication for operation in head injuries varies somewhat in accordance with the degree to which it exists and, above all, with its duration. We find in these cases all shades, from that in which the patient is but momentarily dazed to deep stupor lasting for days or weeks. The severer grades are often accompanied by extreme restlessness and sometimes by delirium. These conditions will be considered later.

In the first place, the absence of any marked degree of unconsciousness does not contra-indicate operation. Such a condition may exist with very extensive cranial injury. I recall a laboring man who was struck in the head with a pickaxe, in a town about seventy miles away, early one morning. He had no loss of consciousness. He took the train to Boston that day, arriving here in the evening, waited and got his dinner, and then walked to the hospital about half-past eight in the evening. On examination a most extensive comminuted fracture, involving about half of one side of the vertex, was found.

Secondly: The degree of unconsciousness does not in itself determine the necessity of operation. In many hospital cases the cause of the loss of consciousness is not uncomplicated. Alcohol plays an important part, and the

influence of this factor must be eliminated. It is well known that a blow on the head of a person addicted to, or under the influence of alcohol, will induce symptoms due to the alcohol which would not have been apparent without such exciting cause. I need hardly mention the occurrence of delirium tremens after injury as an example of this. This affection is usually too apparent to be overlooked. An injury to the head in an alcoholic person, or one under the influence of alcohol, often produces a result which neither the alcohol nor the injury alone would produce. The effects of the alcohol previously latent, suddenly reveal themselves taking advantage of the lessened power of cerebral resistance, and the loss of consciousness is deepened—an alcoholic stupor is added to what might be called the simple or uncomplicated condition due to fracture. Such a patient shows a greater degree of unconsciousness than would naturally occur in a patient free from alcohol who had suffered a like injury, and the unconsciousness in alcoholic cases seems to last longer than in the average non-alcoholic patient. Whether this is a fact can only be determined by considering large numbers of cases, because, as before stated, the degree of unconsciousness is *not* proportionate to the severity of the cranial injury.

Alcohol taken in excess previous to the injury (and this excess need not be such as to be apparent) not only tends to increase the degree of unconsciousness, but also produce delirium. The low, muttering delirium so often seen in older men after a head injury, is usually due to this and may last for days or weeks. To this also is due the temporary delirium and peculiar actions in certain cases which occur at various times in the day, the patient being quite natural in the intervals.

Though the degree of unconsciousness is not proportionate to the severity of the cranial injury, the duration of the unconsciousness is so to a certain degree. I am convinced

that in all cases of uncomplicated head injury in adults, where alcohol and other brain lesions, such as paralytic dementia, can be excluded, in which the patient remains unconscious for over twenty-four hours, operation should on this ground alone be seriously considered. Such a condition points to serious intracranial injury—very possibly a large epidural clot.

Cases occasionally occur in which without intervention the patients remain unconscious for two weeks or more. Experience seems to show that the results would be better were these patients trephined early, and that even a late trephining is advisable. It is scarcely necessary to say that renal and all other complications must be excluded.

Delirium in these cases, if not accompanied by restlessness and fever, and if not due to alcoholism, is exceedingly suggestive of chronic renal disease. When accompanied by restlessness and a high temperature, exploratory operation may be considered. Under these conditions, however, we are rarely without more positive indications to guide us. If delirium, fever and restlessness without other symptoms are found after head injury, the indications for operation are not positive.

Temperature.—When there is a marked rise of temperature shortly after a head injury, and especially when the temperature continues to increase, the prognosis is more or less serious. If not due to complications of other organs it suggests serious injury to the brain and a grave prognosis. It is not a contra-indication except so far as it indicates that operation is not likely to remedy the trouble completely, and that a condition not to be relieved by operation, exists. Subnormal temperature after head injury is frequently due to shock. When not due to shock a subnormal temperature is not in itself a contra-indication to operation. Subnormal temperature without unconsciousness or other symptoms is of no definite importance.

Shock being eliminated, a long-continued sub-normal temperature in an unconscious patient suggests œdema of the brain without severe injury or laceration of the brain tissue. If this œdema is not due to alcoholism, paralytic dementia or renal disease, operation should be considered twenty-four hours after the accident.

Pain.—Acute, severe pain is always a symptom deserving serious consideration in head injuries. In connection with other symptoms it may serve as an indication for operation. In any case where there is severe pain in the head lasting over twenty-four hours, operation is to be considered and a most careful examination made for other symptoms. I can recall at the present moment a case in which a patient was brought to consultation solely on account of persistent severe headache following an accident in which he was thrown out of his wagon. There was no unconsciousness, no fever, no delirium. The patient was able to use his limbs, and except for his headache might have been considered to be in normal condition. The only definite sign found was a dilation of one pupil. It was in this case determined to operate, and an extensive fracture of the cranium was found.

On the other hand, we must be on our guard against functional pain dependent on the general temperament of the patient, rather than on local conditions. A person of neurotic tendency may have severe pain in the head following head injury due in large part to his nervous condition, or aggravated in consequence thereof. In these cases operation is not indicated by the existence of pain. The diagnosis between the forms of pain must be made from the general condition of the patient.

We now come to the more striking symptoms of brain *irritation* and *inhibition*, which are often also of value as suggesting or determining the position of the injury.

CONVULSIONS.

Convulsions may be tonic or clonic, and in either case general (diffuse) or localized. (In the adult, tonic convulsions unaccompanied by clonic are not common in the early periods after head injury.) General tonic convulsions are rare. They would suggest either some complicating affection or possibly an injury in the region of the posterior fossa or of the medulla. Localized tonic convulsions when they occur are apt to alternate with clonic convulsions of the same region, and suggest an irritation of the corresponding intracranial regions.

General Clonic Convulsions. — These are almost always due to some special condition of the patient or some complication. When they exist epilepsy is to be suspected. Epilepsy itself may be the determining cause of the injury, or the shock of the injury may bring on an epileptic seizure. The possibility of its existence can never be neglected in a case where the previous history is not fully known, and where convulsions of this character exist. In these cases the convulsions are accompanied by unconsciousness.

When general convulsions occur while the patient is conscious or semi-conscious, especially if of the female sex, hysteria or functional trouble must be considered, and this must be eliminated. General clonic convulsions may possibly be caused by alcoholic conditions alone, but I consider this doubtful. They may be due to uræmia, which must always be considered before operation is undertaken.

Clonic localized convulsions are important both as determining the advisability of operation in many cases and the place of the lesion. They are not, however, an absolutely certain sign, either of the position of the most serious intracranial injury or of the necessity of immediate operation, but are only suggestive. The most common form of localized convulsions is the hemiplegic, when they involve the muscles of the limbs, and often those of the face on one

side — the side opposite the brain lesion. When definitely localized in one limb, or in one portion of a limb, their significance as showing the exact localization in the brain is greater than when larger areas are involved. Thus, convulsions localized in a thumb, or in certain fingers, or the forearm, would have a great localizing value; but, unfortunately, these closely localized convulsions in the limbs rarely occur. I do not, on the other hand, attach much significance to the affection of certain muscles in the face. The facial muscles seem to be readily affected in many cases. The ocular muscles often show the first signs of the commencing convulsions, whether hemiplegic or general.

It is rare that a special small series of muscles is alone affected throughout a convulsive attack. Many attacks begin with convulsive movements of a few muscles, then of more, and finally nearly all the muscles are affected. Formerly, we attached considerable importance to the determination of the group or groups of muscles first affected in these cases, and this should always be noted, but experience has shown that the importance of this symptom has probably been over-estimated. We find that in several successive attacks different groups may be involved first. We find that the gross lesions involve or affect many centres, and apparently the most sensitive, and not necessarily those most affected are first involved.

Convulsions are of great diagnostic importance in determining the side of the lesion, that is, which half of the brain or its membranes is affected. For closer localization they are apt to be deceptive. This is the rule. There are, however, certain exceptions or limitations thereto. (1) They may also be produced in œdema of the brain in alcoholic patients in cases where at autopsy no gross lesion whatever (except œdema) is found; (2) the side of the brain so affected as to cause convulsions may not be the side of the fracture or of the greatest apparent gross injury. They may be produced by the *contrecoup*.

Hence, when the other symptoms are sufficiently decisive, the evidence of the locality of the injury given by convulsions is to be neglected. For example, if the convulsions, as is sometimes the case, are on the same side as a compound depressed fracture, operate over the fracture. It may not be advisable to operate on the other side at all.

PARALYSIS.

Under this heading we include not only all forms of total paralysis, but also the cases of partial paralysis or marked weakness of muscles.

Inequality of the pupils is always important. This may, of course, be natural to the individual; it may be due to local eye lesions, cataract, etc.; it may be due to syphilis or to other cause existing before the injury. These causes must receive due consideration. If, however, we decide that the evidence is in favor of the condition being due to the injury, we have a symptom of great value in the determination of the situation of the lesion. Unilateral dilatation shows injury on the side of the dilated pupil, and often occurs with fracture of the base on that side. Taken in connection with unconsciousness, this sign, in my opinion, is sufficient to justify operation.

Unilateral myosis, or contraction of the pupil, is much rarer. It would suggest — if not due to some cause unconnected with the injury, as would be most probable — an irritation of the brain on the same side.

Paralysis of the external ocular muscles naturally points to fracture of the base on the same side as the muscles affected. Paralysis of the external rectus is due to injury of the sixth nerve. Paralysis of the internal rectus to that of the third. Paralysis of the fourth nerve is practically not distinguishable in the cases seen immediately after the injury. Paralysis of both sixth nerves suggests fracture of the base on both sides, and very serious injury. I will

merely mention that great care must be taken not to consider a previous strabismus as due to the injury.

Paralysis of the face alone may be due to injury of the seventh nerve when all three branches of the nerve are involved, or to a central lesion when only the lower branches are affected, and the wrinkling of the forehead continues essentially normal. When the lesion involves the nerve it is on the same side as the paralysis. When it involves the brain it is on the opposite side. Nuclear paralyses are so rare that they may be neglected. It is quite possible that the seventh nerve may be injured through the ear.

The most striking form of paralysis, undoubtedly, is hemiplegia. This term is here used to denote paralysis of both limbs on the same side of the body. This points to a lesion on the opposite side of the brain. It may be associated with paralysis of the face on the same side as the hemiplegia, which suggests a more extensive lesion than the affection of the limbs. It may be associated with paralysis of the face on the opposite side, but much more rarely. This is only mentioned to state that when it occurs it may be due to a lesion on the opposite side from the hemiplegia, involving the seventh nerve, and that this is more probable than a hemorrhage in the pons. A hemiplegia may be associated with paralysis of many other muscles, especially the external ocular muscles, but we cannot enter into consideration of these combinations here, as it would lengthen this paper unduly.

The significance of hemiplegia as an indication for operation is great. It might at once be said that when it occurs in adults as direct result of the cerebral injury operation should always be performed unless some special contra-indication exists. This is true whenever the hemiplegia results directly from the injury itself. But, unfortunately, we have a considerable number of cases in which the hemiplegia is not the immediate direct result of the injury, but

is caused by the cerebral œdema which follows, and this condition is specially common in the alcoholic. It is not always easy to distinguish in the unconscious patient the hemiplegia due to an alcoholic œdema from that caused by a direct lesion. In my opinion one point is of special value in this connection. The paralysis in œdema is rarely or never total; it is almost always a weakness or decided weakness, while some power of voluntary motion still remains. Operate, therefore, in all cases of hemiplegia in adults not due to alcoholic or uræmic œdema. Operate, as a rule, in doubtful cases, because even in œdema the opening of the meninges undoubtedly tends to benefit the patient, but in such cases be prepared not to find a clot or fracture, or other visible lesion.

Aphasia, when organic, suggests brain injury or pressure. It usually occurs in connection with unconsciousness or some form of paralysis, more especially hemiplegia.

I shall not consider now the question of operation in the head injuries of children, except to say that with them we should be much more conservative. Children recover without serious results from lesions which would produce much more severe after-effects in adults. The brain apparently adapts itself to a certain amount of localized pressure. Hemiplegias do not have the same serious significance.

SUMMARY.

(1) Operate in all cases of compound depressed and compound comminuted fracture of the cranium. It is usually advisable to operate on any compound fracture.

(2) Simple fracture of the cranium without symptoms does not as a rule demand operation.

(3) Absence of unconsciousness does not contra-indicate operation. The degree of unconsciousness is not in all cases proportionate to the severity of the injury.

(4) The duration of unconsciousness is important, and

when it lasts more than twenty-four hours—no other cause than the injury being present—operation should be considered.

(5) Marked rise of temperature after uncomplicated head injury suggests serious injury to the brain. It is not necessarily an indication for operation. A subnormal temperature without other symptoms has no special significance. When accompanied by unconsciousness and lasting twenty-four hours or more it suggests œdema of the brain or intracranial hemorrhage.

(6) Severe pain in the head continuing for some time after a head injury, if organic, indicates operation. Pain in the head following injury may, however, be functional and due to general nervous conditions.

(7) Convulsions, when clonic and diffuse, suggest epilepsy or other complication. When localized they are of value as indicating the side of the brain on which the lesion producing them is situated. Taken in connection with other symptoms their presence usually favors operation.

(8) The presence of paralysis of the limbs in adults, if marked, usually indicates immediate operation. Partial hemiplegias and paralyses of the limbs may occur in edema of the brain following injuries.

(9) The above statements refer to adults only. In children paralyses are more apt to pass away and the indication for operation is not so decided.

DISCUSSION.

INDICATIONS FOR OPERATION IN HEAD INJURIES WITHOUT FRACTURE.

Dr. G. L. Walton, of Boston: I fear I should hardly do justice either to myself or to a subject of so great scope and practical importance if I attempted to discuss without

familiarizing myself with their contents papers prepared by such accurate observers and painstaking collaborators. I shall venture to present rather a résumé of the principal rules for guidance which seem justified by my own experience in that branch which falls particularly within the province of the neurologist, namely, head injury without sign of fracture.

In these cases the question *whether* we shall advise operation generally resolves itself into determining if hemorrhage is present, and if so, is it accessible, and is it increasing. The question *where* shall the trephine be applied is determined by the seat of the hemorrhage. As in most affections of the central nervous system the seat of the lesion is determined largely by the physical examination, but for its character and course we rely principally on the history.

And it is often the character and course of the lesion which prove baffling in these cases through lack of reliable history or even of any history at all.

A patient is brought to the accident room unconscious or semi-unconscious, restless, perhaps hemiplegic. The seat of the lesion may be often rapidly narrowed by physical examination thus—Impairment of consciousness—brain; hemiplegia—opposite side of brain, etc; but when we ask "Did this come on suddenly or gradually; were there prodromata signifying that apoplexy caused the accident; was there an interval of consciousness; was the fall or blow sufficient to produce hemorrhage; had he previous symptoms of tumor, or of renal disease; was he intoxicated or poisoned; was he alcoholic?", we are answered—"He was found in the street in this condition, and that is all we know about it."

Fortunately the probable lesions in accidents without fracture are limited to hemorrhage, bruising, œdema and alcoholism, or perhaps to more than one of those pathological conditions combined.

What are we to do in this event? In most cases wait till we can establish at least a certain amount of history by our own observation, aided by that of a nurse instructed to look for twitching, deepening of unconsciousness or other symptom of increasing hemorrhage. (For while I agree with Dr. Dwight that the mere presence or absence of unconsciousness is not a question of the first magnitude, the

increase or *decrease* of such unconsciousness is a matter of the greatest importance.) The occasional case in which this policy will lose us an opportunity for successful immediate operation will be overshadowed by those in which the outcome will prove that such operation would have been either futile, or needless and perhaps harmful.

In such a case the symptoms may disappear in a week or may merge into typical symptoms of delirium tremens—diagnosis,—no hemorrhage, the important question as regards operation. Whether the lesion was bruising, œdema, alcoholism, or all three, is not material for this discussion.

On the other hand, the unconsciousness deepens—the paralysis spreads and perhaps rigidity or clonic spasms appear and become general. Diagnosis—hemorrhage still increasing; operate, in the hope of finding it superficial and accessible, whether over or under the dura. Choose for seat of operation the region of the centre of the parts originally paralyzed, but do not make the field of operation too narrow. Remember, too, that original monoplegia favors the cortex, while immediate paralysis of face, arm and leg points either to the internal capsule, or to very extensive cortical or subcortical hemorrhage. Watch the pupil on the well side meantime—its dilatation means middle meningeal artery and involvement of the third nerve—look out also for the Babinski sign, which points inevitably to pyramidal involvement. Do not rely too much on the pulse or temperature; operable hemorrhage may be present without, for example, the slow pulse upon which so much stress is laid in classical descriptions. Again, suppose the patient is not hemiplegic at first, that he recovers consciousness and gets about, but after a few days or a week, has twitching of the face or hand, gradually increasing and spreading to other parts with deepening unconsciousness—this is the classical history of meningeal hemorrhage; operate, the sooner the better, and of course, if this is the history when the patient is first seen, operate at once. If just these symptoms appear operate even if three months have elapsed, or even if no accident has occurred. Do not hesitate to operate because the patient is moribund, with stertorous respiration and convulsed in all extremities, provided the onset of the symptoms corresponded with meningeal hemorrhage. I recall cases of hemorrhage restored to

perfect health by operations performed under these circumstances by Drs. Homans and Mixter, and of abscess by Dr. Jack. But if general convulsions and stertorous respiration appear at the outset, operation will be unavailing. This decision was verified, for example, in a case of death after a blow on the jaw in boxing, in which the post mortem showed laceration of the lateral sinus with flooding of the middle fossa and extension of hemorrhage in every direction.

In another case the mind clears but paralysis remains unchanged. Diagnosis—self-limiting hemorrhage into the substance of the brain, perhaps in the cortex (probably so if the paralysis is limited) but not justifying operation, especially as it may absorb. (Such a case I have recently seen with Drs. Warren and Williams in which paralysis of one foot, with Babinski, appeared early, persisted several weeks and finally disappeared.)

Remember that paralysis may be due to pressure of the uninjured hemisphere against the skull, and trephine the other side as well as the side indicated in case the symptoms clearly point to increasing hemorrhage.

Remember that children are prone to become hemiplegic or hemiplegic immediately after blows on the head, probably from serous effusion into the arachnoid, a process analogous to the formation of a blister. Such paralysis disappears in three or four days, as in a case of Dr. Boland's (monoplegia), and one of Dr. Percy, seen by Dr. Scudder and myself (hemiplegia.) That a similar pathological condition may obtain in adult life was seen in a case reported by Dr. Brooks and myself in which paralysis of the arm followed a fall on the head. Operation over the centre indicated gave rise only to a spurt of serous fluid as soon as the tense dura was incised.

Remember also that hysterical lethargy may follow a blow on the head. This I have seen in one case with Drs. Richardson and Mumford, and another with Dr. Scudder. This uncomplicated traumatic hysteria gradually wears away. Such experiences should lead us to wait and watch the prognosis of doubtful cases before advising operation, particularly in children and young women.

If so-called traumatic delirium appears we should give the benefit of the doubt to alcoholism, even if not acknow-

ledged or not recognized by the friends, and should not operate unless the indications are most decided.

Finally, it is in case of multiple paralyses or spasms and other baffling symptoms that our personal equation comes in play. We may have on the one hand to do with extensive though unrecognized fracture, or with such varied and extensive hemorrhage that operation would be futile, or on the other hand, this may prove one of those cases in which complete recovery shows the lesion to have been nothing more serious than bruising, œdema, alcoholism, or all three. In case of such apparently serious head injury the operator will have no cause for blame if he decides to make exploratory operation, though unsuccessfully, nor if he fails to operate will he often be confronted by a post mortem which causes regret that he held his hand. My own personal predeliction in cases without fracture is to advise operation only when the indications are fairly clear, but in case of fracture, or even of probable fracture, to give operation the benefit of any reasonable doubt.

Dr. BULLARD: I should like to call attention to the fact that in a certain class of cases after injury an aphasia sometimes develops which is hysterical in character and great care should be taken not to mistake that form of aphasia for organic aphasia due to injury. A short time ago a man was brought into the hospital apparently unconscious after a fall of fifteen feet from a bridge into cold water. On recovering consciousness he was found to be aphasic. There was no other paralysis whatever. That case turned out to be entirely hysterical. The man remained aphasic three days and with encouragement recovered. He left the hospital well.

ARTICLE XVIII.

GUNSHOT WOUNDS OF THE HEAD AND CRANIUM.

By LOUIS A. LaGARDE,
MAJOR AND SURGEON U. S. ARMY.

The introduction of steel-armored projectiles of reduced calibre for the military rifle of the civilized nations has modified the subject of gunshot wounds in nearly all the tissues, the head included. The experimenters with this new high-velocity bullet that does not deform on impact noticed in the beginning that the amount of destruction conferred by it at close range was very great, and that this destruction was generally proportional to the velocity and the resistance encountered on impact. When these conditions of velocity and resistance obtained, the destruction took the character of what is often designated as explosive effects. These so-called explosive effects were especially noted in fluid or semifluid tissues enclosed in rigid walls, of which the brain and skull are the most typical examples. Such a lesion is usually characterized by a wound of entrance corresponding in size to the calibre of the projectile inflicting it, and a wound of exit varying in diameter from one to several inches. The channel track between the exit and entrance wounds is much lacerated and marked by the presence of bony sand and spiculæ of bone varying in size from one-fourth to one-half inch. The latter are usually found to have been driven into the tissues, not only in the line of flight of the projectile, but at right angles to it, as

if an internal force had exerted itself in all directions. Many theories have been advanced to explain explosive effects, but it is now pretty generally attributed to the transmission of the energy of the projectile to the particles of bone and other tissues that become detached and then act as secondary projectiles.

In the middle and remote ranges where the remaining energy has become very much less, the destructive effects in wounds of the head by the new bullet are very much less than those inflicted by the old large leaden bullet that was apt to deform on impact.

Gunshot wounds of the head are usually divided into flesh wounds and fractures. The latter are necessarily very fatal. In the Civil War the fatality among all head wounds that reached the hospitals was 28.93%. The fatality of the same class under similar conditions in the Spanish-American War was about the same, 26.09%. The figures concerning the relative number of the two are shown in the following table.*

	Seat and character of injury.	No. of Cases.	Percentage.	Per cent. of all wounds.		Recoveries.	Deaths.	Undetermined results.	Per cent. of fatality.
	Head:								
Civil War.....	Flesh wounds.	7,739	64	3.14	4.9	6,573	2,676	2,480	28.93
	Fractures.	4,350	36	1.76					
Spanish-American War.....	Flesh wounds.	40	56	2.74	4.86	42	18	2	26.09
	Fractures.	31	44	2.12					

The figures illustrate the frequency of glancing shots with the slow-velocity leaden bullet of the Civil War as compared to their infrequency with the high-velocity steel-

* Extract from Borden's Military Surgery, Prize Essay, Proceedings Association Military Surgery, 1900.

jacketed bullet in use at present. The latter, as a rule, travels in a straight line from the point of impact, being seldom deflected from its course by resistant bone. The relative increase in the number of fractures from the use of the modern rifle augments the fatality in head wounds, so that the humane features attributed to this weapon, already referred to, do not apply to wounds of this region. These results were foretold by the experimenters before the opportunity to observe the effects of the new arm in the actual conditions in war had presented themselves. Stevenson,* writing in 1897 upon the proportion of flesh to fractured wounds of the skull, states as follows: "In future wars the proportion will be very different. Omitting indirect and grazing hits, almost every bullet which hits the skull, up to a range of 2,200 yards, will perforate it, and at about 2,900 yards they will penetrate and remain lodged. The destruction produced in the skull and brain by modern bullets is so extreme, even at long ranges, that comparatively few patients will survive long enough to reach the field hospital for treatment, and for the large majority of those who do, treatment will be unavailing."

Concerning the results in the Anglo-Boer War, Makin† states: "Injuries to the head formed one of the most fruitful sources of death both upon the battlefield and in field hospitals." He mentions some "sensational immediate recoveries" among head wounds, and they doubtless were of the character of those noted by us in the Santiago campaign, namely, oblique perforations of the skull cap involving the brain tissue to a limited depth. The gunshot fractures about the base and those running deeply through the brain from base to vertex, or *vice versa*, were uniformly fatal. Of sixty-eight cases of gunshot fracture which were reported in the Surgeon-General's Report for 1900, and

* Wounds in War, W. F. Stevenson, Colonel-Surgeon, British Army.
† Experiences in South Africa, 1901.

which occurred during the two preceding years, 54.4% ended fatally as against 59.2% out of 2,514 cases noted in the Civil War. Unlike wounds of other regions, those of the head, unless properly treated at once, undergo suppuration, a fact which is not surprising when the amount of dirt overlying the scalp is considered. The surgeons in the Cuban and South African campaigns are unanimous in recommending early and free exploration of all cases of fracture of the skull by gunshot. The aim should be to relieve pressure and to rid the wound of all dirt and loose pieces of bone as soon as possible.

DISCUSSION.

Dr. F. A. Harris, of Boston: Naturally a great many factors enter into the production of the results of gunshot wounds of the head:—the calibre of the weapon; the charge of powder; the age of the powder; the distance from which the shot is fired and also the direction. Moreover a decided influence must be exerted by the part of the skull which receives the first impact of the ball.

I have seen a case where a man fired a bullet of twenty-two calibre into his head at such short range that the hair was scorched. The base of the ball was flush with the external surface of the cranium, but as the ball had entered the petrous portion it had not penetrated the cavity of the cranium and did no more than annoy the would-be suicide, who many hours after firing the shot fulfilled his original intention by drowning himself.

On the other hand I have seen a case where a man fired a twenty-eight calibre ball into his head, holding the weapon so far away that there was *no brand* and yet the top of the skull was utterly shattered, there being as many as thirty fragments, and the ball had buried itself in the wall of the room. This case, to be sure, was that of a Jew, a race whose skulls, according to my personal experience, (whatever may be the general fact) are of most unusual thinness.

There is no sure way of determining the direction of a ball after it has entered the skull. As is well known even so thin a membrane as the pericardium may deflect a ball, and how much more likely is such deflection to be caused by the tables of the skull. To localize a bullet in the head is a task of extreme difficulty, inasmuch as the ragged track made through the cerebral tissue serves to obscure signs which might avail in an injury to the brain of a different sort.

I have found that as a rule the ball is more or less mushroomed in its passage through the bone and from this flattenned and ragged condition far greater injury is done to the cerebral tissue than would be done by the passage of a smooth ball.

I have found the track of the ball through the brain marked not only by disorganized brain substance but also by spiculæ of bone of greater or less size, as well as by fragments of lead scraped from the ball by the sharp edges of the tables of the skull. Even if the bullet could be successfully located and removed, it would be almost practically impossible to cleanse the wound through its entire extent, and remove all these foreign particles which together with the countless punctate hemorrhages would be foci for the starting of an undoubtedly fatal inflammation, allowing that the shock of the original wound was not sufficient to cause death.

I have never observed extensive hemorrhage to result from gunshot wounds of the head doubtless because in those cases where life has been prolonged for any considerable time no important vessel has been wounded, the death resulting later from acute inflammation.

A few remarkable cases like that of Dr. Harlow and that of Dr. Morton demonstrate the miraculous toleration of severe injury to the brain substance, but my own observation of what occurs in consequence of the penetration of the cranium by a bullet makes me in the highest degree pessimistic as to the results of a possible operative procedure with a view to saving life.

ARTICLE XIX.

TECHNIQUE AND AFTER-CARE OF OPERATIONS UPON THE CRANIUM.

By CHARLES L. SCUDDER, M.D.,
AND
HARRY H. HARTWELL, M.D.
OF BOSTON.

Horseley, Wagner, Phelps, vonBergmann, Keen, von-Frey, Lauenstein, Gigli, Codivilla, Braatz, Treves, von-Esmarch, Senn, Macewen and König—these are the men who have recently contributed valuably to the literature of cranial surgery. The work of these men, as well as that of others, has been reviewed in the preparation of this brief communication.

We have been asked to present for your consideration the present generally accepted technique of operations upon the cranium following injury, and to state the method of caring for these operated cases.

OPERATION HAS BEEN DECIDED UPON.

Preparation of the patient.—The evening before the operation a laxative is given; the morning of the operation an evacuating enema is administered. One quarter of an hour previous to the operation $\frac{1}{4}$ gr. morphia is given subcutaneously. (We are of course supposing that the patient is an adult.) The whole head is shaved, including the eyebrows. It is washed with soap and warm water and scrubbed

with a nail brush. The soap is rinsed off with clean water and then with alcohol. The head is then washed with permanganate of potash (a saturated solution) with a saturated solution of oxalic acid, with a solution (1 to 2000) of corrosive sublimate. Care is to be exercised that none of these strong solutions enters the eye or the external auditory meatus. The corrosive sublimate solution is washed off the scalp with boiled sterile water. The face, neck and ears are protected by a sterile towel fastened snugly about the head. The patient is in the recumbent posture. The head is placed upon a firm surface. It is often convenient to support the head upon sand bags. The parts about the patient are covered with sterile sheets and towels. All instruments, sponges of gauze, sutures and ligatures are properly sterilized. The anæsthetizer prepares himself for the operation as the surgeon does. The proximity of the anæsthetizer to the field of operation demands that every precaution should be taken against his infecting the wound. He should wear cap, face mask and gloves, and use clean cones for ether or chloroform. If the patient be unconscious no anæsthetic will be required. Chloroform or ether will be the anæsthetic employed. There is less excitement and cerebral congestion associated with chloroform anæsthesia than with that of ether.

When a wound of the scalp exists, which possibly communicates with the brain, the same preparation of the head is made excepting that the scalp wound is carefully cleansed by means of small swabs of gauze wet with boiled sterile water, gently but firmly and searchingly introduced into all accessible parts of the wound. The wound is then thoroughly douched with boiled sterile water. It is unwise to use in the wound under consideration strong antiseptics. The bone is thoroughly exposed by enlarging the wound, as may be required.

When there is no wound of the scalp a semi-lunar flap

is raised, the convexity of the flap being toward the median line. The knife cuts directly to bone. The periosteum is removed from the bone by means of a very broad elevator at the same time that the skin flap is retracted. The flap should be ample. A small flap is difficult to work under. Bleeding from the flap is instantly checked by artery pressure forceps. The whole thickness of the scalp is grasped by the pressure forceps. It is a waste of time to attempt to compress each vessel singly. The flap is well retracted by vulsellum forceps (double hooks) or in the absence of these by a suture passed through the free edge of the flap and tied long.

There is a fracture of the cranium.—It is a *fissure;* there is no depression about the fissure. The fissure is followed a distance to determine its direction, its involvement of important cavities—the orbit, the nose, the frontal sinuses and the ear. Continuous oozing of blood from a fissure may mean a serious intracranial lesion. A fissure due to trauma must not be confused with one of the sutures of the cranium. Ordinarily blood can be wiped away from a suture, but it cannot be wiped away from a fissure. The situation of the supposed fissure is helpful in determining its identity. If it is at all likely that dirt has entered a fissure it can best be thoroughly removed by changing the fissure into a gutter by using a small bone gouge held at a great angle with the surface of the bone.

The fracture of the cranium is depressed.—In such fractures the inner table is usually more extensively broken than the outer. The problem presented therefore is not merely how to elevate the depressed fragment or fragments, but how can the depression be relieved without further damage to the underlying sinuses, dura and brain. Necrosis forceps may readily remove loose fragments. The bone may possibly be raised by the introduction of an elevator beneath it.

In a comparatively few cases it will be found necessary to use the trephine. A trephine one inch in diameter is the best for this purpose. The trephine is applied to the sound bone near to the fracture. Two-thirds of the circle of the trephine will be upon the sound skull and the remaining one-third will be over the fractured area. Moving any of the fragments of bone while trephining is to be carefully avoided for fear of injury to the parts beneath. Upon removal of the bit of bone access is had to the parts to be elevated; this is accomplished by the elevator introduced under the fragment to pry it into place. Hemorrhage from lacerated sinuses or other vessels, which perhaps shows itself first when the depressed fragment is ever so cautiously removed, is controlled ordinarily by gauze packing. It may be wise, in order to avoid damage to deeper parts when fragments of bone are much depressed and driven underneath the intact skull, to trephine over the deeply depressed end of the fragment and thus be enabled to remove such fragment more intelligently. The area from which hemorrhage occurs will then be opened to inspection. It is best to leave only those fragments of bone in the wound that are well attached to periosteum or dura. Completely detached fragments should be removed.

Suppose another case:

There is no evident fracture, and no wound of the scalp.—Intracranial hemorrhage is suspected. The previously mentioned systematic preparation is carried out so far as is possible. The scalp flap is reflected. The 1¼ inch or 2 inch trephine is placed 1½ inches behind the external angular process of the frontal bone and 1¼ inches above the zygona in order to find the anterior branch of the middle meningeal artery from which hemorrhage is suspected. As soon as a groove has been cut throughout the whole circumference of the trephine, the trephine pin (if one has been used) is removed—it has served its duty of steadying the

trephine. The bone dust is dry until the diploë is reached; it is then soft and bloody. It is a good plan while trephining any part of the skull to imagine that it is the thinnest skull in existence and that it is of variable thickness at different parts of the groove. This will tend to make one proceed cautiously. At frequent intervals the depth of the groove should be measured by inserting into it the eye end of a needle held by a pair of pressure forceps. A slight feeling of irregularity will be detected as the needle is carried around the groove; if the inner table has been perforated, the needle will catch slightly instead of moving smoothly. All bone dust is immediately wiped away. As one side of the groove reaches the inner table great caution is needed that in completing the section the dura is not injured. The trephine is tipped slightly towards the uncut portion; greater pressure is put upon this side as the cut is made. Then the button of bone is removed entire. If the button is not easily removed, no attempt to remove it should be made by tipping the trephine and prying it out. A narrow elevator will often remove it in whole or in part, and then the rongeur forceps will complete its removal and smooth the edge of the opening. If the opening made is insufficient it is enlarged by the rongeur forceps. If the hemorrhage is from the meningeal artery the clot is evacuated, the vessel secured by fine silk ligature or a suture of fine silk is passed with a small curved needle through the dura and around the vessel and tied. The bone removed is not to be replaced.

Drainage of the wound should be based upon the same principles as drainage elsewhere. Bleeding from the bone will often cease spontaneously after a few moments; if not the bone may be crushed about the bleeding vessel or a plug of sterile wood or Horsley's wax plug may be used. If there is much oozing of blood or serum or cerebrospinal fluid, and if infection is suspected, drainage is to be em-

ployed. Under other conditions it is not to be used. The wound is best drained by a small, soft rubber tube. The wound in the scalp is closed in whole or in part by sutures of silkworm gut.

If the dura is to be opened, it is incised by the knife and divided by a small pair of blunt-pointed scissors, avoiding so far as possible all vessels. The dura should be divided a quarter of an inch from the bony opening to permit of subsequent suturing, if that is deemed necessary.

The after-care of the operation of trephining. — In uncomplicated cases the patient is kept in a darkened room and as quiet as possible for three or four days. A cold water bag or coil is kept constantly on the head. Calomel in divided doses ($\frac{1}{10}$ gr. each hour for ten doses) is given by mouth. The diet is for the first few days a liquid one. After a week or a week and a half the patient is allowed to be up.

In cases complicated by probable intracranial lesions the patient must be kept quiet a longer time. The wound is cared for according to ordinary surgical principles. If a drain has been used, it must be proved to be efficient. If provisional sutures have been placed, these are tied upon removal of the drain.

Hernia cerebri is the term applied to a protrusion of the brain through the opening left after trephining. This occurs when there is abnormal intracranial pressure. The whole mass of the hernia is not ordinarily brain tissue, but is largely made up of granulation tissue — fungous granulations. It is a most distressing condition which may complicate especially septic cases. Cleanliness, compresses of alcohol and support to the part are indicated.

Concerning the closure of bony defects of the skull, how harmful such defects are, whether pedunculated flaps of periosteum shall be used to close them, or gold foil or rubber tissue or egg membrane or celluloid disks, these questions are still open for discussion.

The value of the Gigli saw is undoubted, and its use in forming osteoplastic flaps for exploratory purposes is of extreme interest, but this does not concern us in this discussion. The electric motors used to drive a saw or trephine are not likely to come into general use.

ARTICLE XX.

THE ANNUAL DISCOURSE.

SURGICAL TUBERCULOSIS.

By HERBERT L. BURRELL, M.D.
OF BOSTON.

DELIVERED JUNE 10, 1903.

NOTE.—At an Adjourned Meeting of The Massachusetts Medical Society, held Oct. 3, 1860, it was

Resolved, "That The Massachusetts Medical Society hereby declares that it does not consider itself as having endorsed or censured the opinions in former published Annual Discourses, nor will it hold itself responsible for any opinions or sentiments advanced in any future similar discourses."

Resolved, "That the Committee on Publications be directed to print a statement to that effect at the commencement of each Annual Discourse which may hereafter be published."

SURGICAL TUBERCULOSIS.

Mr. President and Fellows
of The Massachusetts Medical Society:—

The treatment of tuberculosis is a subject that concerns everyone. All citizens, particularly members of the medical profession, should recognize that tuberculosis is the greatest scourge of mankind and is an enemy that all should strive to conquer. We are apt, in these days of individualism, of unbounded opportunity for personal development, of expert knowledge on special subjects, to consider that the great questions of citizenship, such as concern public health, should be left to the care of the State.

Physicians have recognized, in a somewhat limited manner, that tuberculous patients should be under conditions in which they may avoid a re-infection from the tubercle bacillus, and their processes of repair and powers of resistance may be increased to the highest degree.

Surgeons have not been as keen to appreciate these principles in the treatment of tuberculosis as physicians. Their attention has been concentrated on the treatment of the local lesion. Many surgeons consider that a tuberculous area must be removed; some surgeons regard the area as little less than malignant and feel that a tuberculous lesion must be attacked as if it were a cancer. Relatively few surgeons consider that to increase the patient's power of resistance to

I am indebted to Dr. Wm. H. Davis for valuable assistance in collecting the literature of this subject.

fresh invasions of the tubercle bacillus is of as great importance as to operate and remove a local area of tuberculosis.

A few orthopedic surgeons and genito-urinary surgeons recognize the importance of out-door treatment. General surgeons, however, are too apt to consider that an operation on a local tuberculous area ends their duty. They fail to appreciate that probably in many instances an area of tuberculosis is simply a local manifestation of a more or less general infection by the tubercle bacillus, in an individual whose power of resistance is lowered.

When the attention of a general surgeon is called to the importance of increasing the powers of resistance in an individual patient, as a rule, he acquiesces to the plan that out-of-door treatment should be given patients with surgical tuberculosis, and in an individual case he may adopt this line of treatment. He does not insist, however, on this treatment being given all patients having surgical tuberculosis.

I, therefore, beg your consideration of the means by which surgical tuberculosis can be treated and what modifications in our methods are desirable. The consideration of the subject divides itself as follows: 1, prevalence; 2, diminution; 3, pathological consideration; 4, sanatoriums; 5, construction of sanatoriums; 6, hospitals; 7, out-door treatment of tuberculosis; 8, tent treatment; 9, home treatment; 10, effects of sunlight and electric light; 11, defects of hospital construction.

Prevalence.—Tuberculosis in its various manifestations undoubtedly kills more people than any other disease. From one-seventh to one-tenth of the total death-rate of the world is dependent upon tuberculosis. Craig* states that "It has been recently estimated that there are one million cases of active tuberculosis in the United States, and the latest authentic statistics show that 14% of the deaths recorded for ten years are due to some form of tuberculosis."

* Journal of American Medical Association, 1902, p. 229.

Cuzner* states that "Schlenker made 100 consecutive postmortems on adults and children. He carefully examined every part of their bodies and in 65% found tuberculosis. In over 4000 successive postmortems made in Breslau in 1893, one third of the bodies contained gross tuberculous lesions. If the microscope had been used, probably enough lesions could have been discovered to make 2500 infections. Babes found lesions of the bronchial glands in more than one-half of his postmortems on children. Biggs could demonstrate characteristic lesions in the lungs alone in 60% of his postmortems. Grawitz found primary tuberculous deposits in the lungs in 152 out of 221 cases, this being nearly 70% of all infections.

The most remarkable statistics as to the existence of tuberculosis are those of Naegeli,† drawn from 508 consecutive autopsies done at the Pathological Institute at Zurich. Naegeli did 500 consecutive autopsies and found that 97% of all adults over 18 years of age who died in the Cantonian Hospital were tuberculous. He states that every organ must be carefully examined, grossly and microscopically,

TABLE I.

		Sections.	No T. B.	T. B.	% T. B.	Fatal T. B.	T. B. %	Not fatal T. B.	Not fatal %
67 autopsies from Nov. 4–Dec. 3, 1896.	Under 18	7	5	2	28	1	50	1	50
	Adult	60	15	45	75	21	$46\frac{2}{3}$	24	$53\frac{1}{3}$
95 autopsies from Jan. to March, 1897.	Under 18	19	18	1	5	4	100		
	Adult	76	8	68	90	26	38	52	62

Amount of tuberculosis in consecutive autopsies. Naegeli.

* Journal of American Medical Association, Chicago, 1898, vol. xxxi, 1458-63.

† Ueber Haufigkeit, Localisation und Auskeilung der Tuberculose, nach 500 Sectionen des Luricherishen Pathologishen Instituts, von Dr. Med. Otto Naegeli, Arch. Path. Anat., vol. 160.

for tuberculosis. When this was done, it was found that 97% of adults, in a series of 164 cases, had tuberculosis. The first two series of autopsies are appended in Table I.

Naegeli found that the constitution of the individual had no influence as to the presence of tuberculosis. The most powerful gymnast in the prime of his twenty years was no more immune than the feeble, slender shop-girl with flat thorax and so-called phthisical habit. He found that latent tuberculosis was present not alone in those who suffered from chronic affections but in those who died suddenly from wounds of all kinds.

The next two series of autopsies, 346, were even more carefully performed and showed from 97% to 98% of tuberculosis in adults.

TABLE II.

		Sections.	No T. B.	T. B.	% T. B.	Fatal T. B.	T. B. %	Not fatal.	Not fatal %
110 autopsies April–July, 1897.	Under 18	15	12	3	25	3	100		
	Adults	95	3	92	97	21	23	71	77
236 autopsies July, 1897–March, 1898.	Under 18	47	38	9	24	6	66⅔	3	33⅓
	Adults	189	3	186	98	42	22	146	78

Amount of tuberculosis in consecutive autopsies. Naegeli.

He found that in the first year tuberculosis is exceedingly rare; from one to five years it is still rare but is nearly always fatal; from five to fourteen years it is found in one-third of all bodies examined and causes the death of three-fourths of those it attacks. Reasoning from these statistics, between 14 and 18 years, one-half of the population has been infected with tuberculosis and the process is then always active and but rarely arrested. One-third of all deaths that occur at this period of life are due to tuberculosis.

DIMINUTION. That there has been a great diminution in the number of cases of tuberculosis is readily shown by statistics. Dr. Samuel W. Abbott, Secretary of the State Board of Health of Massachusetts, states* that in New England, with a population of 5,103,187 for the five years, 1893–1897, there were 50,027 deaths, a rate of 19.70 per 10,000. The decrease in the last half century is remarkable. In 1853 the death-rate from pulmonary tuberculosis in Massachusetts was 42 per 10,000 inhabitants; in 1895 the death-rate was 21.8 per 10,000 inhabitants.

TABLE III.

For every 10,000 living there died in the following years:

	TUBERCULOSIS.		PHTHISIS.					
	Prussia	Bavaria	Saxony	Baden	Hessen	Hamburg	Alsace Lorraine	Austria
1876	31		23.6	31.6		31.2		
1877	32		25	30.4	28.5	33.		
1878	32.5		26.	29.4	27.2	33.7		
1879	32.5		25.8	31.5	27.6	33.5		
1880	31.1		25.8	28.3	26.9	31.5		
1881	30.9		23.8	28.6	26.1	31.5		38.5
1882	30.9		23.6	30.7	27.1	30.9		38.1
1883	31.8		24.6	31.2	28.2	33.1		40.4
1884	31.		25.1	29.9	26.3	34.7		39.4
1885	30.8		25.	32.2	29.2	32.6		40.7
1886	31.1		24.9	30.5	29.2	30.8	30.4	40.1
1887	29.3	33.4	23.	27.8	27.	30.9	29.8	37.2
1888	28.9	31.5	23.5	29.6	29.	30.9	30.9	38.6
1889	28.	33.5	23.8	27.7	28.3	26.8	28.7	36.2
1890	28.1		24.2	29.2	30.1	26.2	28.9	39.7
1891	26.7	32.9	21.6	27.1	27.1	26.5	27.9	36.6
1892	25.	31.3	20.8	26.	24.1	25.3	25.4	36.9
1893	25.	31.5	21.5	27.1	27.	24.	24.8	35.4
1894	23.9	31.6	21.4	28.2	26.	20.8	25.7	37.3
1895	23.3	31.1	21.0	26.7	25.8	21.	23.4	
1896	22.1	29.4	20.1	26.5	24.3	20.4	22.3	
1897	21.8	30.	19.8	25.5		20.1		

* The Past and Present Condition of Public Hygiene, p. 67.

Table III, taken from Nothnagel,* shows the mortality from tuberculosis and phthisis in continental countries from 1876 to 1897, shows the diminishing prevalence.

It is naturally interesting to consider the causes that have diminished the frequency of tuberculosis. Dr. Alfred Hiller, in a paper on the "Extinction of Tuberculosis,"† gives a striking chart showing that at the present rate of decrease in the deaths from pulmonary tuberculosis, Prussia will reach the zero point about the year 1927, whereas in England at that time there will be about eight deaths per 10,000, and the total extinction will take place only about twenty years later. The rapid fall in the Prussian rate is ascribed to (1) the precautions against infectious diseases, due to the discovery of the tubercle bacillus; (2) the improved conditions of the working classes caused by the Workmen's State Insurance Laws; (3) the establishment of sanatoriums.

Table IV‡ gives the mortality of 662 villages in France from phthisis and other forms of tuberculosis in 1891. This presents a general idea of the relative frequency of phthisis to other tuberculous affections, and it demonstrates the large number of cases of tuberculosis that occur in a large city like Paris, when compared with a village of 5000 inhabitants. The number of cases to the thousand inhabitants in Paris that occurred was 4.9%. The number of cases to the thousand inhabitants in places less than 5000 inhabitants was 1.81%.

The greater danger of urban life is exemplified by this statement of Dr. H. M. Biggs of the New York Health Board that "One block on Cherry street was inspected on Jan. 1, 1895, and contained 1000 tenants. One hundred and four cases of tuberculosis have been reported in that block in four years and nine months. In a block on Pell

* Special Pathology, Vol. xiv, p. 472.
† English Journal of Public Health, of March, 1903.
‡ La Tuberculose et son Bacille, par I. Strauss, Paris, Rueff et Cie, 1895, p. 482.

and Mott streets, containing a population of 2000, 318 cases occurred in four and a half years.

TABLE IV.

		Exact Figures.			Number proportional to 1000 inhabitants.		
	Population.	Phthisis.	Other T. B. affections.	Total.	Phthisis.	Other T. B. affections.	Total.
Paris	2424705	10287	1608	11895	4.24	0.66	4.9
11 cities having from 430000 to 100000 inhabitants	2143380	6262	1535	7797	2.92	.71	3.63
46 cities having from 100000 to 30000 inhabitants	2361244	5474	1764	7238	2.31	.74	3.05
50 villages having from 30000 to 20000 inhabitants	1220019	2595	935	3530	2.12	.76	2.88
127 villages having from 20000 to 10000 inhabitants	1799443	3682	1219	4901	2.04	.67	2.72
332 villages having from 10000 to 5000 inhabitants	2274757	3773	1164	4937	1.65	.51	2.16
95 places having less than 50000.	330802	493	107	600	1.49	.32	1.81
	12554350	32566	8332	40898	2.59	.66	3.25

Mortality from phthisis and other forms of tuberculosis. Strauss.

The relative frequency of surgical tuberculosis is difficult to determine because the mortality statistics do not, as a rule, record surgical tuberculosis. Table V. gives one an im-

pression as to the relative frequency of tuberculous affections other than phthisis. The tables show the mortality at Hamburg* in 1872–1898.

TABLE V.

MORTALITY IN HAMBURG FROM PHTHISIS, FROM 1872–1898.

Age	Less than 1 yr.	1 to 5	5 to 15	15 to 20	20 to 25	25 to 35	35 to 50	50 to 70	Over 70 yrs.	Total.
Male	534	1240	791	1113	2081	5922	7968	4278	350	24277
Female	385	1169	1230	1071	1518	3956	4160	2255	345	16089

MORTALITY IN HAMBURG FROM TUBERCULOSIS OF OTHER ORGANS, 1872–1898.

Age	Less than 1 yr.	1 to 5	5 to 15	15 to 20	20 to 25	25 to 35	35 to 50	50 to 70	Over 70 yrs.	Total.
Male	1033	1764	696	131	116	221	301	243	42	4547
Female	788	1427	659	123	87	157	180	177	43	3641

Leonte,† states that surgical tuberculosis is most prevalent from ten to thirty years of age.

His conclusions are drawn from the following series of cases: From 1896 to 1899 there were 1393 cases treated in the hospitals of Roumania; from 1895 to 1899, 2949 cases were treated in the hospitals of Ephorie; from 1898 to 1900 there were 149 cases treated in Leonte's hospital service at Brâncoveassu. A large number of these cases of surgical tuberculosis were of the bones and joints.

Summary. From the above statistics I think it is fair to state that from 80% to 90% of men and women who reach the age of 40 years have had some form of tuberculosis. This statement, if true, is significant and illuminating.

* Zeitschrift fur Tuberculose, 1900, p. 329.

† Ueber die Chirurgische Tuberculose. Buletinal Asociatunei Medicolor, 1901, p. 212. Zeit. fur Tuberculose und Heilstatteunssen, p. 169, March, 1902.

It should give us the point of view that in dealing with tuberculosis we have a universal enemy, but that, after all, the majority of us are going to conquer this enemy. Tuberculosis is often spoken of as malignant in character, yet this can hardly be true, for if it were malignant in the majority of individuals the human race would be swept from the face of the earth.

Pathological Considerations.—The knowledge of the behavior of the tissues when infected with tubercle bacilli will be of assistance in defining the treatment that should be given an individual case.

The following brief account of the pathology of the disease is abstracted from the syllabus of pathology by Drs. Councilman and Mallory:—The organism enters through the respiratory tract or alimentary canal. It may enter also through the skin, through wounds, in which case a local lesion is produced. The extent and character of the lesion depends upon the number of bacilli, their virulence, the susceptibility of the individual, and upon the mode of infection and the anatomical character of the organ infected. The usual effect produced by tubercle bacilli is proliferation of cells, leading to the production of large epithelioid cells. The tubercle bacilli lie in and between the cells. (Fig. I.) Later, other cells appear, the most conspicuous of which are the giant cells. Miliary tubercles are formed of epithelioid and giant cells with or without a reticulum and are small circumscribed masses varying from .1 mm. to 1 mm. in size. Miliary tubercles undergo degenerative changes, but they do not tend to increase in size by peripheral growth. A nodule is formed by the continuous formation of miliary tubercles in the perpiphery. With the cell proliferation which is dependent upon the presence of tubercle bacilli there is more or less exudation, and this forms a part of the tuberculous area. A miliary tubercle does not tend to enlarge indefinitely, chiefly because there

is gradually formed around it a tissue which is relatively resistant to the action of the bacilli. Such a tissue is also formed around the large conglomerate tubercles. This tissue is converted into dense, cicatricial tissue resistant to the action of bacilli and containing few blood vessels or spaces by means of which the bacilli can pass through the encircling wall. This is peculiarly interesting, for it may plainly be seen that a great effort is made by nature to encompass and control the attack of the bacillus. It is not known how long tubercle bacilli can live enclosed in such a mass. Occasionally the barrier may be penetrated and the old focus form the starting point of a fresh infection. The most rapidly fatal forms of tuberculosis are those in which the exudative (Fig. II.) processes are the chief lesions. The mass formed by the caseation of tuberculous tissue and exudation may remain in an unchanged condition. If composed chiefly of cells it is soft and easily broken up. It is firmer if connective tissue has entered into its formation. It finally may become calcified. (Fig. III.) A much more important process is that of softening. By this the comparatively firm caseous mass becomes changed into a soft or semi-fluid material. This softened material may be carried into the surrounding tissues and general infection may occur. Accepting that this is the general behavior of a tuberculous infection, whether it be in the lung or in the intestine, it is apparent that nature is doing all she can to combat the infection and that we should simply supplement nature in her efforts. A tuberculous process in a lung and in a joint differ largely because of the anatomical differences in the tissues invaded, but the same general principles of infection and repair maintain.

How can we assist nature in her effort to cure the ravages of the tubercle bacillus? She herself surrounds the infection as soon as may be by a wall of dense fibrous tissue. It seems to me that physiological rest to the involved struc-

ture, and improving the powers of resistance of the individual, are clearly the lines along which we should render assistance. This leads naturally to the treatment of tuberculosis in sanatoriums, out of doors and in hospitals.

Sanatoriums.—The great value of sanatoriums is not alone the control of the infectious patient but their educational influence on the tuberculous patient. Patients are taught a proper conduct of life, taught to protect their fellow-beings from infection, and they are placed, in many instances, on the road to permanent recovery.

The principles of sanatorium treatment in general are well laid down by Dr. T. N. Kelynack.* He states that in selecting a suitable case for sanatorium treatment it is well to remember what hygienic management seeks to secure: (1) The removal of the patient from fresh invasion by the tubercle bacillus, and separation, as far as possible, from all influences aiding in its introduction. (2) The establishment in the patient of processes of repair and the development of the highest power of resistance. To this end the instruments employed are:—(1) Continuous exposure to fresh air. (2) Free access to sunlight. (3) Regulated rest. (4) Controlled exercise. (5) Abundant feeding. (6) Obedience to hygienic requirements. (7) Strict medical supervision. The life in a sanatorium is well described in an article by John H. Lowman ("The Conflict with Tuberculosis," Cleveland Medical Journal, October and November, 1902). He states that the food in a private hospital is such as one would find in a good, well-managed hotel. The patients are allowed to eat as much as they please, but are not forced. As the patient gets stronger he is allowed more exercise. Patients, as a rule, sleep well. The windows are widely opened at night, except in the coldest weather, when the transom is opened. The life in a sanatorium is monotonous, but not necessarily

* Medical Record, Nov. 18, 1902, p. 736.

irksome. Amusements are discouraged; cards and casino life are not permitted. Even chapel exercises and church-going are not approved. A visit to the neighboring village is apt to be followed by a cold, which is in reality an infection caught from association with outside people.

In England, sanatoriums have existed for many years and they are regarded as places for the cure of tuberculosis, not as the home of incurable cases. In France, there are a few sanatoriums principally devoted to the care of children. Germany one finds to be the home of the sanatorium.

The greatest credit is due to such men as Brehmer, who first started the sanatorium at Goerbersdorf in 1856. In this country we owe a debt of gratitude to Trudeau, of Saranac Lake, who has demonstrated in such a public-spirited manner the value of sanatoriums.

The Imperial Health Office at Berlin* states there are at present fifty-seven public sanatoriums for the tuberculous in Germany, of which thirty-four are located in Prussia. The Imperial German Government, the governments of the different states, the executive authorities, the national insurance institutions, and the municipal governments, are seriously and actively participating in the work of combating tuberculosis.

Germany is the best equipped country in the world for the treatment of tuberculosis, and its statistics show correspondingly favorable results. Hammer† states that in Germany 20,000 people can be given yearly a three months' treatment in her institutions.

The relation of the insurance companies in Germany to the control of tuberculosis is very interesting, and it is hoped that action may be taken by some of the insurance companies in this country towards controlling tuberculosis. The Old Age and Invalid pension laws of Germany

* American Medicine, March 21, 1903, p. 440.
† Munschen Med. Woch., 1902, 49, 1081–85.

(Lowman *ibid*) which were formulated by Bismarck are very suggestive in their scope of action. Under this law every workman and domestic must be insured by his employer against incapacity for work from old age or invalidism and against sickness and accident. Under this law are a number of sick benefit insurance societies, and their reserved fund is $175,000,000. From this fund the sanatoriums are sustained. By an amendment to this law, passed by the Reichstag and called paragraph 45, the insurance societies are permitted to withhold the weekly money benefit from a beneficiary and give it to a sanatorium, and compel the patient to go there to reap the advantage of his insurance.

Frank Warner* states that the United States as a government operates but two sanatoriums, one the Army Hospital and Sanatorium for the treatment of pulmonary tuberculosis at Fort Bayard, New Mexico, and the other the United States Marine Hospital Service Sanatorium at Fort Stanton, New Mexico. One has only to read the reports of these sanatoriums to become convinced that the amount of good accomplished is very great. The New Jersey Legislature has appropriated $300,000 for a sanatorium in which the tuberculous poor may be treated.

Massachusetts has established a State sanatorium at Rutland, but Boston has been singularly negligent in this important public duty. Freudenthal† states that there are 25,000 tuberculous patients in the Borough of Manhattan and recommends the establishing of "farming colonies." He states "We can acquire land enough in this State and in many places near by at a very reasonable price for the purpose of establishing farming colonies. This should be laid out in large farms, and these will fulfill several requirements. Part of the ground should be used for the erection of dwellings for the consumptive colonists and the

* American Medicine, March 28, 1903.
† New York Med. Jour., 1902, p. 146.

rest cultivated. While a large handsome hospital building with all modern improvements looks imposing, it is entirely too expensive for the purpose. I therefore propose to erect tents instead. You can erect many tents for the amount of money that would have to be expended on one building alone. That all hygienic demands can be fulfilled in the best and cheapest way in tent life, every one who has had some experience on that subject will admit." Directly in line of this statement is the statement that there is proposed a sanatorium for the treatment of tuberculosis in New York City with an estimated cost of buildings of $530,000, 480 beds.* This plan provides for a group of structures, the general arrangement of which will be fan-shaped, with the administrative building in the centre and the pavilions projecting like the sticks of a fan, thus giving each pavilion a maximum of light and air. The pavilions are to be two stories in height and connect with each other and the administrative building by covered corridors. Here are two definite plans, one for a sanatorium outside a great city, the other for treatment in tents. The proposed sanatorium to cost $530,000 with 480 beds is too expensive to meet the problem that is presented in the control of tuberculosis.

There is a definite drift of opinion that a change of climate is of less importance in the treatment of tuberculous patients than was supposed, and that it is far more important that the tuberculous should have open air life and a maximum of sunshine, wherever they may live. Kime very sensibly states† that in treating tuberculosis "it is not a question of climate, of elevation, of heat and cold, of dryness or of moisture. Wherever an abundance of God's pure air and sunshine may be had, there may this disease be successfully treated."

* American Medicine, March 21, 1903, p. 444.
† Phila. Med. Jour., 1900, VI, p. 1057.

I give some illustrations showing one of the barracks (Fig. IV.) and one of the resting places (Fig. V.) at the sanatorium at Magdeburg. Figs. VI. and VII. are views of Trudeau's sanatorium at Saranac. Figs. IV., V., VI. and VII. are taken from Zeitschrift für Tuberkulose und Heilstattenusen. Band I, 1900.

In France there are over 20 seaside and mountain sanatoriums, with between 2000 and 3000 beds, mostly for children with tuberculosis. At Ormessau and Villiers the sanatoriums are on a breezy and somewhat unprotected high plateau. The treatment of tuberculous children at the sanatorium at Cap-Breton and at Berck-sur-mer is of a good deal of interest.

Lalanne has charge of the sanatorium at Cap-Breton for the treatment of scrofulous lesions.* Cap-Breton is not really a village but a multitude of little Swiss cottages scattered over the sand near pine forests and close to the ocean. The sanatorium of Cap-Breton is situated upon a dune twenty meters above sea level and 100 meters from the shore. This sanatorium was founded by widow Desjobert, who left 1,200,000 francs to establish a hospital for poor scrofulous children. In this sanatorium there is an abundance of air and light. The climate of Cap-Breton is influenced by the following factors:—(1) the nearness of the ocean, (2) the passage of the Gulf Stream some kilometers from the shore, (3) the proximity of the pine forests. The mean temperatures at Cap-Breton are 13°C in the spring, 22°C in the summer, 14°C in the autumn and 9°C in the winter. In the coldest weather the temperature at Cap-Breton has never fallen below 1°C. Here also there is an abundance of sunlight. The pine forests are far enough away so that they do not affect the action of the sun's rays. There about 250 sunny days in the year. The water is warm enough for bathing from July 1st to October. At

* Bordeaux Theses.

other seasons house baths of warmed sea water are used. The windows of the sanatorium are kept open during the winter nights to permit plenty of fresh air. During the winter days the patients can be out the entire day upon the beach warming themselves in the sun. 71% of patients received at Cap-Breton are cured. Lalanne gives the following typical picture of the improvement of a child:—Upon his arrival at the seashore the child is pale, indolent, sad and morose. He is weak and sickly owing to the bad air of the large cities and the lack of hygienic surroundings. He dislikes to move and nothing interests him. The appetite (though sometimes good) is often poor, capricious and irregular. A few days after his arrival his appetite improves, but the greatest improvement is to be seen only after some weeks or even months. Then there is a veritable transformation; his condition is stronger, he has the color of health, his muscular powers are doubled, he no longer has that torpor and indolence, he is full of that animation which characterizes children with strong constitutions, he is gay, active, expansive and turbulent. Surgical treatment at Cap-Breton is eminently conservative. They seek to improve the debilitated constitutions and only intervene surgically when it is absolutely necessary. Prolonged treatment at the seashore often suffices to cure many tuberculous manifestations without surgical intervention.

At the sanatorium at Berck-sur-mer, Calot* treats many forms of external tuberculosis. The general treatment of these cases consists of the use of some medicines, cod liver oil, etc., wholesome, abundant food, the observance of good hygiene, the choice of a proper climate and a proper place. Calot believes that sea air is preferable to the air of the country. This probably is a detail. Calot has children even in bed who are taken out daily during the whole winter; the hood of their little carriages pro-

* Bordeaux Theses.

tects them from the rain and snow and large coverings protect them from the cold. The face is uncovered or is half protected with a veil. The cold weather stimulates the appetite and all the tissues of the organism. The temperature rarely becomes so severe as to prevent patients going out. One of the hospitals at Berck was temporarily located 500 meters from the sea for one year and then was moved to the shore. Calot and his assistants noticed that after exposure of the sick to the sea air, the cures of the worst cases became more numerous, more rapid and more complete.

Lannelongue,* Gibney† and Sprengel‡ all recognize the importance of general and outdoor treatment of tuberculous children.

Formiliant§ reports excellent results obtained in the sanatorium on the shores of the Baltic Sea near Windau. Marcou-Mutzner‖ refers to a sanatorium at Hendaye of 200 beds where they receive children from 2 to 15 years of age. The sojourn is from 6 to 9 months. The classes of cases include rickets and anemia but especially cases of initial visceral tuberculosis. The therapeutic agents are the sea air and climate, not extra alimentation and not rest. In one sanatorium it costs but 90 centimes per day to support a patient.

Construction of Sanatoriums.—It is interesting to see the different supplementary plans that are advocated for the treatment of tuberculosis. Let me mention that of Dr. Lederle¶ of the New York Health Department who has sent a letter to Mayor Low urging the appropriation of $35,000 for the establishment of a sanatorium for the treatment of tuberculosis on the tent plan. It is proposed to erect this camp on a tract of 20 acres in Orange

* Gaz. d. Hop. Paris, 1899, lxxii, p. 145.
† Virginia Med. Semi-monthly, Richmond, 188, p. 375.
‡ Berl. Klin. Woch., Dec. 23, 1901.
§ Zeit. fur tuberculose and Heilstatt, July, 1902, p. 366.
‖ Ibid, p. 369.
¶ American Medicine, April 11, 1903, p. 563.

County, which has been offered to the city for two years, rent free. Dr. Lederle states that with the $35,000 he could provide a camp for 60 patients from May 1st to Dec. 31st next. In Germany the following plan has been advocated. Several physicians and a number of associations in Berlin propose to build a large floating sanatorium with roomy, open-air wards, medical supervision, and a complete equipment for scientifically testing the effects of sea air on tuberculosis. The cruising ground is to be the northeastern Atlantic, in the neighborhood of the Canary Islands. Should success attend the effort, other floating sanatoriums will be built. The voyages will last about six weeks.

A most valuable competition occurred recently in England where King Edward VII. offered prizes for the best essay with plans for a sanatorium for tuberculosis in England. One hundred and eighty essays were submitted in competition and the three prize essays were published in the Lancet of January 3, 1903.

The plans of Dr. Latham's essay, Fig. VIII., and Dr. Morland's essay, Fig. IX., appeal to me in that they offer a maximum of sunshine and fresh air.

Hospitals.—Hospitals have not, as a rule, recognized the necessity for providing for the out-door treatment of tuberculosis. Dr. F. Rufenacht* states that "in several of the General Hospitals and Infirmaries in England, such as St. Thomas' Hospital in London, the North Staffordshire Infirmary at Stoke upon Trent, the Sheffield Royal Infirmary, etc., consumptive patients have been treated with more or less success by open air methods. In the new Infirmary for Camberwell, the top story in each wing is to be set apart for the the open air treatment of consumptives and is to have nearly all its wall space occupied by windows."

* London Zeit. for Tuberculose, 1901, p. 297.

Burdett* states that "the Bethany Hospital in Berlin has had broad balconies added to the wards where many of the patients are kept in bed, not only in the daytime, but at night." He gives plans and descriptions of the new University Hospital at Halle, which has wide verandas on the south side of the four surgical wards only, the windows being casements, opening down to the floor, so that a bed can be rolled or carried out. He states that the new hospital at Saint-Denis also has verandas on the south side of the wards. The story of the doctors who kept their patients out on the balcony until nine o'clock at night, and finally tried leaving them out all night, at the Bethanien Hospital in Berlin, is interesting. They were entirely convinced by practical experience, by patients sleeping out of doors, of the benefit of this treatment.

Out-door treatment of Tuberculosis.—All of the foregoing leads me to believe that the necessity for out-door treatment of surgical tuberculosis is not sufficiently well recognized by general surgeons.

The improvement that occurs in tuberculous nodes of the neck, without operation, has for years attracted my attention, and in many instances where an operation was inexpedient I have advised the patient to live and sleep out of doors. In the majority of these cases there has been marked improvement and in some cases apparently permanent recovery.

One of the first instances that attracted my attention to the importance of the out-door treatment of surgical tuberculosis was a patient upon whom I had operated for tuberculous peritonitis. The patient, a woman, aged 38, had a typical condition of the peritoneal cavity. She was operated upon, a large amount of fluid was removed, the peritoneal cavity was drained for a fortnight, and the abdominal wound then healed; yet for months the patient did

* Hospitals and Asylums of the World, vol. iv., p. 60.

not improve in the way we expect following an operation for tuberculosis of the peritoneum. During the summer she lived in a tent, and from the time that she lived and slept out of doors her improvement was very marked. During the summer she gained eighteen pounds, all evidence of tuberculosis disappeared and three years later she was apparently in perfect health. At the time this occurred I considered that her improvement was simply a delayed one following operation.

A most striking instance of improvement occurred three years ago. A man, 37 years of age, who was married, came to me for tuberculous epididymitis. The vas deferens on the affected side was corded and knotty. A careful examination of the urine was made and tubercle bacilli were eventually found. Naturally an unfavorable prognosis seemed inevitable. An operation was done and the tuberculous testis and cord were removed. After waiting three or four weeks, the patient having cystitis with tenesmus, a suprapubic cystotomy was done. Two small tuberculous areas, one the size of the little finger-nail, were found at the base of the bladder. Suprapubic drainage was established and I finally advised the patient to go to his home and make himself as comfortable as possible, as a fatal ending was more than probable. The patient was of more than ordinary intelligence and, turning to me, asked if there were nothing else that could be done in the way of general treatment for the disease. He himself suggested to me that if people with pulmonary tuberculosis were benefited by living out of doors, he might be made better by living and sleeping out of doors. I, of course, acquiesced, and he had a tent constructed on his lawn and slept there from April 15th until into December,—out of doors practically every night during the summer. He gained during this time 34 pounds, or from 118 pounds to 152 pounds. At the end of three years apparently the tuberculous pro-

cess has been arrested, he is engaged in his ordinary occupation, that of a book-keeper, and I believe his life has been saved, not by my operation, but by a recognition of the value of out-door treatment of tuberculosis.

In spite of the warnings and protests of experts in the treatment of pulmonary tuberculosis, two errors with regard to the out-door treatment of pulmonary tuberculosis remain deep-rooted and wide-spread in the profession. The first is the sending of patients in advanced stages of tuberculosis to sanatoriums. The second is the failure to recognize the need of absolute rest, literally, sitting still out of doors all day long, on every day, so long as there is evidence that the tuberculous process is still active.

Trudeau has intelligently insisted upon the need of absolute rest during the active period of tuberculosis.

The natural cure of tuberculous areas, it seems to me, demands three things:—(1) physiological rest to the part; (2) pure air and sunlight; (3) ample nutrition to the tissues to check the progress of the process. At the best, the tuberculous area in a lung must "throw out of commission" that part of the lung for the time being. There are not many principles in medicine or surgery, but if there is one in which I thoroughly believe, it is that of physiological rest,* and this principle is just as applicable to the treatment of pulmonary tuberculosis as it is to the treatment of a tuberculous area in the hip- or knee-joint.

Tent Treatment.—Occasionally, here and there within the past few years have appeared suggestions as to the out-door treatment of surgical tuberculosis. Dr. H. P. H. Galloway in 1902,† before the American Orthopedic Association brought forward and advocated strongly the use of tents for the treatment of tuberculous joint-disease. (Fig. X.) Dr. Galloway claims that while out-door life is of

* Hilton's Rest and Pain.

† The general management and constitutional treatment of Tuberculosis of bones and joints. Special reference to the use of Tents.

great assistance in the treatment of all tuberculous bone and joint affections, it is particularly useful in that class of patients whose recuperative power seems to have been exhausted and are being slowly worn out by discharging sinuses which other means of treatment have failed to heal. He does not claim that tents offer the best solution of the problem of securing the nearest approach to continuous out-door life, but that properly designed tents suitably located are much better than the average hospital ward, and that they are an efficient and inexpensive supplement to the regular wards. He thinks that with private patients an effort should be made to secure the benefit of sunshine and fresh air, when for any reason residence in a sanatorium is impracticable or undesirable. Many patients who have a lawn in connection with their homes can be induced to fit up a private tent and occupy it even during the winter months.

For many years the Boston City Hospital, under the administration of Dr. Rowe, has had a tent service in summer, in which, at times, surgical patients have been treated. The advantages of this service have been very marked. Figs. XI. and XII. show the perspective of this out-door camp and an interior view of one of the tent wards.

The means to gain this out-door life for patients are many. An excellent type of tent is described by A. Mansfield Holmes. Figs. XIII., XIV. and XV. show the construction of the tent pavilion. The approximate cost of constructing these tent cottages is $60.00.

Home Treatment.—Dr. Millet, of East Bridgewater, has recognized the necessity for caring for his patients by out-door life, and his article on "The Night-Air of New England in the Treatment of Consumption"‡ is extremely suggestive and very valuable. Dr. Millet has been good enough to let me have illustrations of the "shacks" that he has had built for the treatment of tuberculous patients

‡ Maryland Medical Journal, Jan., 1900.

(Figs. XVI. and XVII.), also of the balconies or verandas where patients sleep, that have been "built out" in connection with many cottages. Figs. XVIII., XIX., XX. and XXI. are balconies built out from buildings in Brockton and Bridgewater, and here the patients sleep, from May until November or December, only the rainy nights driving them in. The improvement in these cases, I am told by Dr. Millet, is very great indeed.

The public are quite aware of the benefits of out-of-door treatment, and Phil May has expressed in Punch, March 4, 1903, the length to which this fad may be carried. (Fig. XXII.)

A. A. Babrow* believes that surgical or local tuberculosis is simply a manifestation of a general infection and may be grouped under two forms, showing certain dissimilarities in their course; the one is a chronic process, characterized by infiltration and formation of new connective tissue; the other is also chronic at times, though oftener subacute, and consists in a cellular infiltration which forms tubercles and through their necrosis leads to cheesy degeneration. In either instance the advent of pus cocci transforms the sluggish process into an acute inflammation. In the absence of a specific remedy our therapeutic efforts must aim at increasing the patient's resisting powers, thus aiding him to overcome the microbic invaders. All hope of salvation by removing the diseased part is distinctly illusory, since surgical tuberculosis must be considered as the local manifestation of a general infection. We combat the chronic non-suppurating variety with local rest and counter-irritating measures, like hot applications, iodin, or the cautery, which all act beneficially by attracting leucocytes and phagocytes to the affected tissues, as well as by stimulating the local circulation. A similar result is obtained by incising and packing with gauze strips, in order to direct

* Russki Vratch, Jan. 18, 1903.

the current of tissue fluids outward. These measures, however, are inadequate when we come to deal with necrotic and suppurating forms of local tuberculosis. Here active interference is called for and operative removal of dead or diseased tissue is advisable. It is to be recognized that such operations are merely palliative measures, as the complete removal of affected areas is impossible in view of the persistent general source of infection. When this truth is recognized, surgeons will no longer be so anxious to operate, but will seek rather to increase the strength of the patient and pave the way for nature's own cure. In this connection climatic influences deserve all recognition. Prolonged stay (one to one and one-half years) at the seashore exerts a marked salutory effect especially in the case of children; the sea air, the bathing, and, not least, the sunlight, contribute their respective share to the final result. Solar rays play a highly important role in the treatment of local tuberculosis and patients should be instructed to expose the diseased parts to the sunlight.

Effects of Sunlight and Electric Light.—In connection with the exposure of wounds to sunlight, it is interesting to consider the use of the Finsen light. Dr. Valdemar Bie,* who is associated with Finsen at Copenhagen, as his assistant, states that Finsen has discovered that sunlight or arc electric light produces a widening of the skin capillaries which may last for five or six months.

"Finsen has demonstrated a widening of the capillaries of the skin which lasts for a long time, as a result of light. Finsen exposed the skin of his arm to an electric arc light; upon the arm were various glass plates and also two letters of the alphabet drawn with India ink; where these covered the skin, the skin retained its white color; the lighted part of the skin, on the contrary, became red, swollen, and later pigmented. After a period of four months the skin was still

* Light Therapy, Deutsche Aerzto Ztg., Berl., 1902, Aug. 15, ii, pp. 361–5.

so pigmented that the white areas were still visible where the glass plates had been; but after five or six months the entire skin was white. If one now rubbed the skin, the marks again became visible, in that the portions of the skin which had been covered with the glass plates did not become so red as the surrounding skin. The dilatation of the vessels of the skin which results from exposure to light can, therefore, last five to six months."

The effect upon the capillaries is only produced where the ultra-violet rays strike the skin. Light produces a stimulating effect upon all the lower animals, and Finsen has proven this upon the embryos of Salamanders and upon worms. He has also shown that the stimulating influence is due to the actinic rays. These rays penetrate cartilage and skin but are absorbed by the blood. This was interestingly proven by Finsen, who found that by rendering the ear bloodless the light would pass through the cartilage and would not pass through the ear when it was filled with blood. The ultra-violet rays have ten times as much bactericidal power as all the rest of the spectrum taken together, but they have very little power of passing through the skin. The chemical rays of light do not reach the deeper parts of the body at all, or at most in a very limited degree. The literature on the use of Finsen's rays is becoming very interesting and one of the best articles is that called Phototherapy, by Professor Niels R. Finsen, Copenhagen; translated by James H. Sequeira, M.D., Lond., M. R. C. P., 1901. There can be little doubt but that the use of Finsen's rays is of definite value in certain cases. Its exact value and limitations have not been determined, but the use of sunlight, it is clear, has been demonstrated from time immemorial. Prof. Poucet allows the sunlight to fall upon a diseased joint two or three hours daily, and Millicz has written a thesis on this subject. Poucet states: "I cannot criticize the results that Millicz describes as good; but

a direct influence upon the tubercle bacilli in this way is not possible; it is hardly to be denied that the nourishment of the limb may possibly be improved by the rich blood supply which results from the light bath."

Robinson* states that the importance of sunlight in tuberculous patients is becoming more and more generally recognized. Abrams† has done some interesting experimentation on the penetrability of the solar rays. He finds that a dry skin is very resistant to the penetration of the solar rays; that the penetrability of the skin is increased by using lanolin externally and subcutaneous injections of distilled water. A very interesting experiment was done, which should be verified. Subcutaneous inoculations with a virulent culture growth of tubercle bacilli were made upon rabbits. The animals were then subjected to the action of the solar rays concentrated at the point of inoculation on ten consecutive days. No tuberculous process resulted, while in other rabbits similarly inoculated but not subjected to sun there resulted tubercles (in which tubercle bacilli were found).

Other experiments were conducted to determine whether the solar rays in greater concentration could be employed by interposing colored glass which, in a measure, excluded the heat rays and allowed unimpeded passage to the chemic rays. The result was an unequivocal demonstration of the fact that when such media were interposed, it was always at the expense of the actinic action on solio-paper. Abrams has used the solar ray in the treatment of a tuberculous ulcer of leg which had resisted the conventional treatment, including rest and curetting, for over a year. The ulcer healed in less than three weeks under treatment with the solar rays. He has also used solar rays quite extensively in aborting furuncles and in the treatment of cervical lymph noditis of presumable tuberculous origin.

* Phila. Med. Journal, 1899, iii, pp. 54–6.
† Phila. Med. Journal, 1899, i, pp. 175–8.

My colleague, Dr. F. S. Watson, has written me a letter of which the following is an abstract. The letter shows clearly that the out of door treatment of surgical tuberculosis is not properly recognized.

DEAR DR. BURRELL:—

It is a remarkable fact that, with the constantly present object lesson afforded by the results of Climatic and Hygienic treatment of pulmonary tuberculosis, when properly and conscientiously carried out, as it is in the best sanatoriums and elsewhere in the hands of some experts individually, so little effort should have been made to apply the same principles to those forms of disease usually classed as surgical. That this is true is indicated by such facts as the following:—

(1) No paper has been presented before the American Surgical Association urging the adoption of that method of treatment for surgical cases, whether in conjunction with or without surgical treatment.

(2) Physicians connected with sanatoriums for the treatment of tuberculous disease, and those practising in the health resorts frequented by persons with phthisis, see but very few patients having surgical forms of the malady. This is illustrated by an inquiry recently undertaken by the writer as to the results of the climatic treatment in that class of cases, in the course of which he addressed a circular letter to every member of the American Climatological Association, which almost all of them were kind enough to answer. The questions were put with regard to tuberculosis of the genito-urinary organs only, and asked the personal experience of those gentlemen as to the results of its climatic treatment. There were just four out of the whole number who did not say that they had no experience in the care of such cases. Of the four, there was one who had had twelve patients of the sort, and the other three reported their observations with regard to from one to four cases, and had not seen more than that number. Some years ago a similar request for information was sent to twenty representative general practitioners, and none of them had knowledge of more than three cases at the most and there were but two or three patients whose history was known definitely for long enough periods to give them any value.

The replies of the members of the American Climatological Association furnished the following information with regard to sixteen cases. In five there was complete arrest of the disease. Seven showed great improvement but still had evidence of the disease. Two were not improved. Two died.

The reply of Dr. Henry Loomis is of interest though it does not supply details. He says, "A number of cases have been sent to the Loomis Sanatorium by genito-urinary specialists for climatic treatment. The results have surprised everybody" (in their favorable character). He refers specifically to one case considered as hopelessly ill by Dr. K yes, who sent him for that form of treatment, in which the patient was "perfectly well at the end of a year."

It is not necessary to quote from the other letters. I will refer briefly to six cases under my own observation for periods of 18 years in the longest, to ten years in the shortest, in which the patients, though not having been under systematic climatic treatment, have all led out door lives and been in very favorable conditions. Three of them were subjects of renal and three of testicular tuberculosis. In all there has apparently been an entire arrest of the process. In one the disease began in the testes and the seminal vesicles were invaded. Here it has remained without further extension for five years, the patient being in robust health all the while.

This year at the meeting of the American Association of Genito-Urinary Surgeons in Washington, one of the best and most experienced observers among the surgeons of this country, Dr. Chismore of San Francisco, made the first definite and strong plea that has been presented to the Association for a more extended trial of climatic treatment for cases of genito-urinary tuberculosis, as opposed to the surgical treatment.

We are fairly familiar with the results of surgical treatment of some forms of tuberculosis, notably those in which the disease is seated in the bones, which is the most favorable form of tuberculosis which comes under the surgeon's care, and those which involve the genito-urinary tract, in some of which the radical surgical treatment is far from encouraging, to say the least,—nephrectomy for renal tuberculosis, for example, despite the few brilliant successes that have attended it.

What we lack is knowledge of what can be accomplished by the climatic and hygienic treatment of these cases, either in conjunction with surgical treatment or without it, according to circumstances. We can get no information from general practitioners, specialists, or surgeons, for they none of them have had any important experience in the matter, nor shall we have this knowledge supplied until sanatoriums for the treatment of surgical tuberculosis are provided, or else special provision in the present ones is made for the reception of such cases, and are put in the hands of competent surgeons. The medical specialists do not feel competent to assume the care of cases of a surgical character, therefore, surgeons cannot send such cases as need surgical care as well as climatic treatment to resorts which are appropriate otherwise. There are signs of awakening interest, however, in this matter, and it is fairly safe to predict that the pendulum will begin to swing in that direction before long, go to the inevitable too great extreme, and then settle down to its proper excursion.

Very truly yours,

F. S. Watson.

From the foregoing it may be seen that orthopedists and occasionally genito-urinary surgeons have recognized that surgical tuberculosis requires something besides operation. The treatment of tuberculous areas should include not alone active operative measures, when necessary, but the surgeon should always consider the expediency of exposing them to the sun's rays. General surgeons have not recognized its importance.

Defects of Hospital Construction.—A ward for the treatment of surgical tuberculosis should have as its prime essentials a maximum of sunlight and the ability to move the beds out on a veranda, where the patients may sleep, if expedient, day and night. It is perfectly obvious that it is impracticable to construct a hospital at practically $1,000 per bed for the treatment of such a universal scourge as tuberculosis and I now wish to speak of some of the defects that I believe exist in modern hospitals. The failure to

recognize that a hospital must have the maximum of air and light is lamentable.

Recently I had occasion to visit a modern hospital which had been constructed by eminent architects in one of the most intelligent communities in New England. It seemed to me defective in many points. The hospital was beautifully situated but it was winged forwards at the east and west so that much of the south sunlight was shut off. Many of the administration rooms of the hospital were on the south side, which should be devoted entirely to wards and bedrooms. The best part of the hospital building, the top, was occupied by a laundry. The most central part of the buildings where there is the maximum of sunlight, was used as a reception room for visitors. The doors were smooth and made of jointed boards, but the butts projected. The angles and corners of the room were rounded off, but it would require hours each day for a diligent housemaid to clean the carved mantles. The windows were not flush with the wall but were dust-traps. In one small room the best sunlight was excluded by a tree. The conventional shade, lace curtains and picture-molding existed in many of the rooms, but the beds were provided with an aseptic, smooth, painted, steel temperature chart. The windows in the building were small and of such a height that if opened slightly at the bottom the wind would blow directly upon the beds. The walls were not built of hollow brick and already the water of condensation was forming on the walls. The operating room was elaborately fitted with a chandelier directly over the operating table, so arranged that the dust could be readily shaken into an open abdominal cavity. There were gratings over the ventilating shafts instead of cheese cloth. Expensive foot water-taps, which were complex in construction, afforded lodgment for dirt. The wall area in one ward had about one-fifth of the total possible window space. There were no piazzas. Convalescent patients could be placed on

a roof garden which was reached by a ladder. The kitchen was in the northwest top corner of the hospital and the ward maids had the most sunny rooms in the hospital. The engineer of the building slept in a room in the cellar, with a 2x4 window. The operating room had tiled floor, glazed brick, and a marble dado, but the steam pipes were so close to the wall that the room could not be mechanically cleaned.

This construction is going on at the present time in many of our modern hospitals; and it is very natural that it should occur. The Board of Managers tell their superintendent that they want a building to cost a certain amount of money; they employ the best architect they know, a man who may or may not have made a study of hospital construction. The architect and the superintendent of the hospital are placed practically in charge. Rarely is the staff of the hospital more than allowed to look at the plans of the building. The architect naturally turns to the superintendent as the one representing the Board of Managers and what the superintendent wishes is put into effect. Superintendents of hospitals, as a class, are not aware of the advances that are being made in medicine, and of the necessity for air and sunlight in the wards of a hospital. They feel and believe that a monumental structure is necessary, but in consequence of their environment and isolated position, so far as the medical profession is concerned, they do not realize that a new order of hospital construction is or will be imperative. The economies of hospital construction have never, so far as I know, been deliberately studied as have those, for example, of mill construction.

If the State is to deal with the great problem of controlling an almost universal scourge, tuberculosis, a more economical construction of hospital buildings is imperative. This can be done only by architects who are willing and anxious to meet the demand of a minimum cost of construction combined with superintendents who are familiar with, and ap-

preciate the necessity for, the maximum amount of air and sunlight in their buildings.

Prof. T. M. Clark, architect, of Boston, has given me the plans for the building of a proposed sanatorium for Dr. Millet, of Brockton, Mass. (Fig. XXIII.) I find that he has carefully considered the essentials in construction of a hospital for tuberculosis: 1. He has made provision for the maximum of sunlight and air. 2. He has arranged the rooms so that a bed may be wheeled out of doors on a piazza or balcony. 3. He has provided a sun parlor at the top of the building. 4. He has studied the economy of construction. We should recognize that all the south side of a hospital should be devoted entirely to the treatment of patients, and that the north side should be reserved for hospital administration.

Conclusions: The prime essentials for the treatment of tuberculosis are physiological rest, out-door treatment and ample nutrition to the patient. Whether the tuberculous area is in the lung, in a joint, in a lymph node or in the intestines is a detail. Where it is possible, the tuberculous area should be excised, especially if it threatens to invade vital structures: combined with the removal of the tuberculous foci, patients should be treated by physiological rest, fresh air and sunlight. The excision of a small area from the hip-joint, while it may give a brilliant immediate surgical result as to first intention and a cure, mutilates the patient. On the other hand, by the recognition of physiological rest and out-door treatment, such patients may be efficiently treated and life and limb saved.

In the modern construction of hospitals we do not sufficiently recognize the necessity for a maximum of sunlight and air; provision is not made to allow patients in their beds to be moved out on to verandas, that they may be in the air and properly protected.

There is perhaps no community that is so well supplied

with cottage hospitals as New England, and yet how little are they used for the out-door treatment of tuberculous patients.

If the physicians and surgeons of the cottage hospitals in New England will utilize their hospitals for the treatment of tuberculous patients, on the lines of physiological rest and out-door treatment, and will do less major surgery, for example, brain tumors, they will do more good in the community than they do at present. The health of this Commonwealth is largely in the hands of the members of this Society, and if I can impress upon you the necessity, in dealing with this problem of tuberculosis, first to advocate the establishment of an adequate number of sanatoriums for the treatment of tuberculosis, either by the State, cities or towns, a step will have been taken towards its control. Again, as members of The Massachusetts Medical Society, you should recognize that it is not necessary that your patients suffering from tuberculosis should be sent far from their homes, but that by erecting bed platforms, as Dr. Millet has done at the patients' homes, they may be satisfactorily treated in their own homes. The work which is being carried out by Dr. Bowditch at the Sharon Sanatorium is worthy of the highest commendation, but that is for a specially selected class of patients. The work which is done at Rutland must command our admiration, but it is to you, as the practitioners of this Commonwealth, who visit from time to time the homes of the people, that I turn and beg that you will consider the necessity, in tuberculosis, both medical and surgical, of treating patients by physiological rest, and giving them the maximum of air and sunlight.

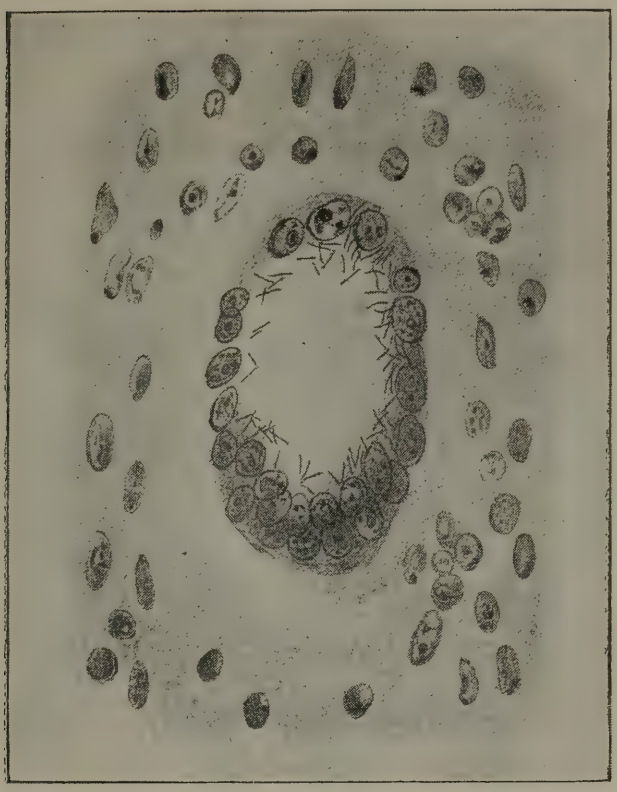


FIG. I.—A giant-cell showing tubercle bacilli between the nuclei in the periphery of the cell.
R. Koch: Ætiologie der Tuberculose. Mitt. aus dem Kaiserlich. Gesund. Berlin, 1884. Band ii.

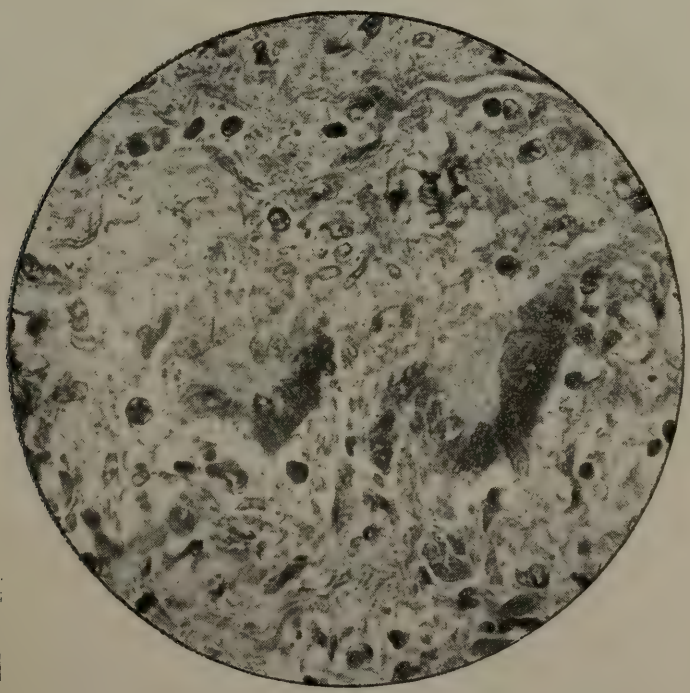


FIG. II.—Extensive tuberculous process, showing abundant exudate and giant-cells.
(Courtesy of DR. MALLORY.)

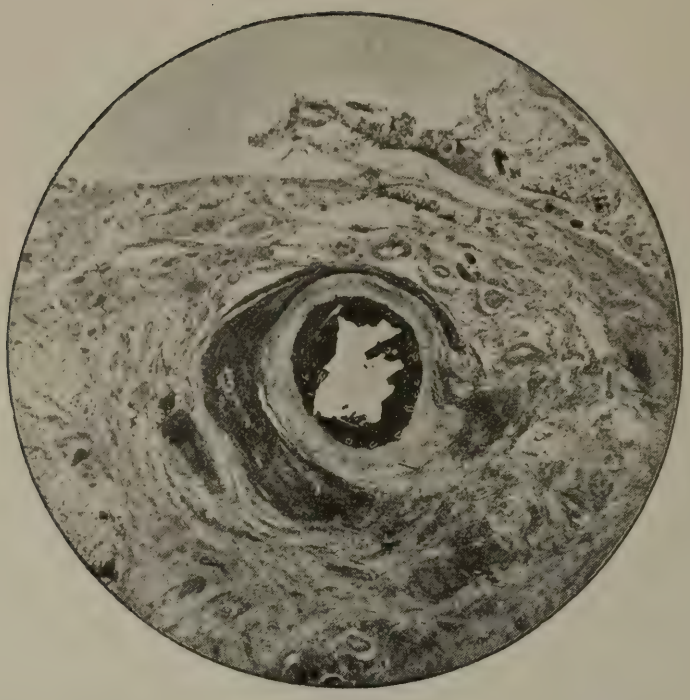


Fig. III.—An advanced stage of a healing tuberculous process, with calcification.
(Courtesy of Dr. Mallory.)

Fig. IV.—Barracks at Magdeburg.

FIG. V.—A resting-place or out-of-doors shelter at Magdeburg.

FIG. VI.—Large, airy, well-lighted recreation-room at Trudeau's Sanatorium at Saranac.

FIG. VII.—Verandah at Saranac in the winter.

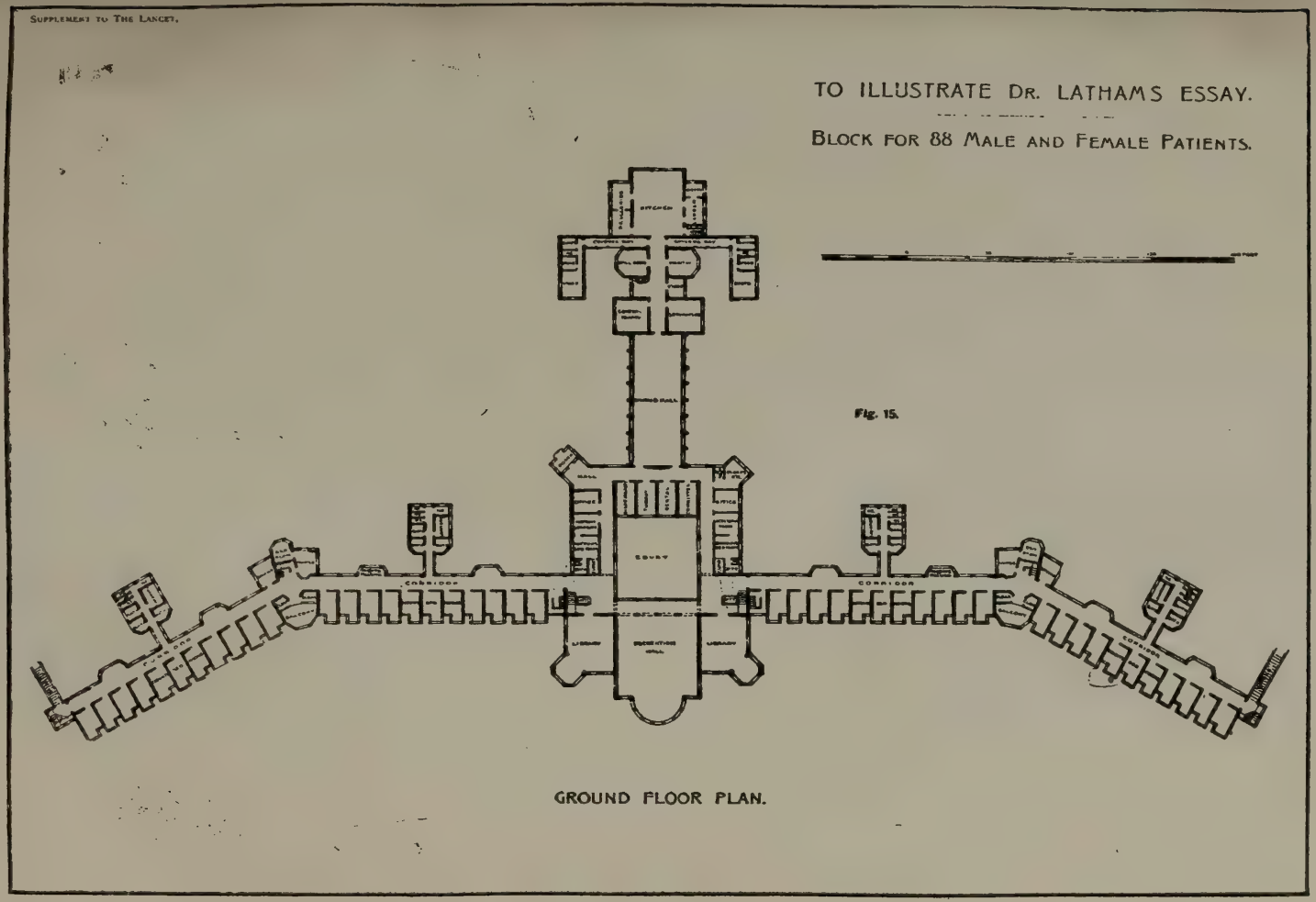

Supplement to The Lancet.
TO ILLUSTRATE Dr. LATHAMS ESSAY.
Block for 88 Male and Female Patients.
Fig. 15.
GROUND FLOOR PLAN.

Fig. VIII.

TO ILLUSTRATE DR. MORLAND'S ESSAY.

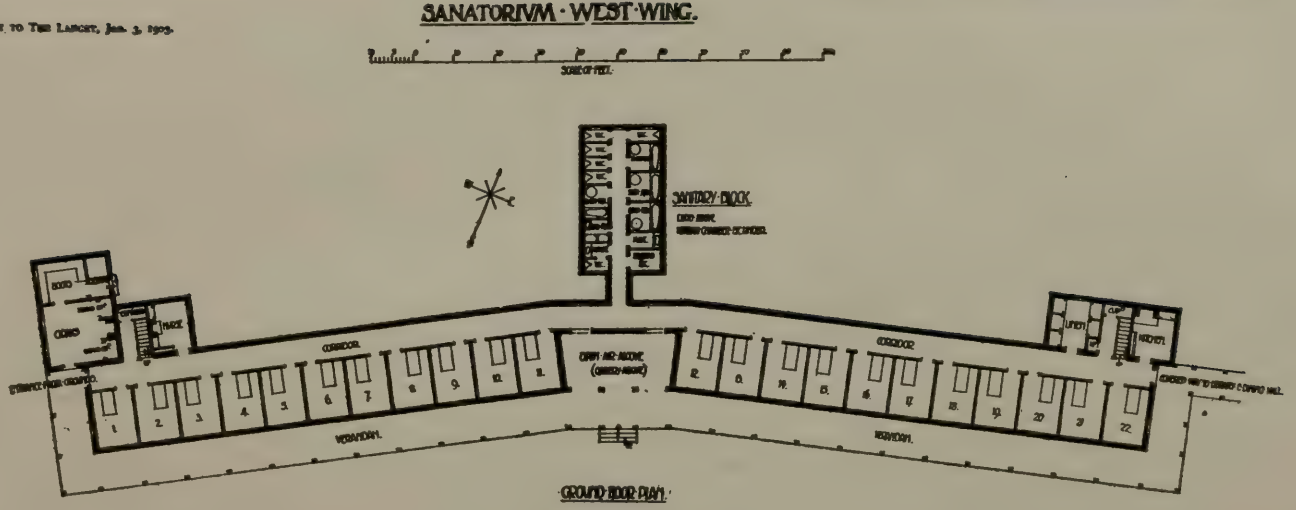


Fig. IX.

FIG. X.—Tents used by Dr. Galloway at the Toronto Orthopedic Hospital.

FIG. XI.—Tent-wards. Boston City Hospital.

FIG. XII.—Interior of tent-ward. Boston City Hospital.

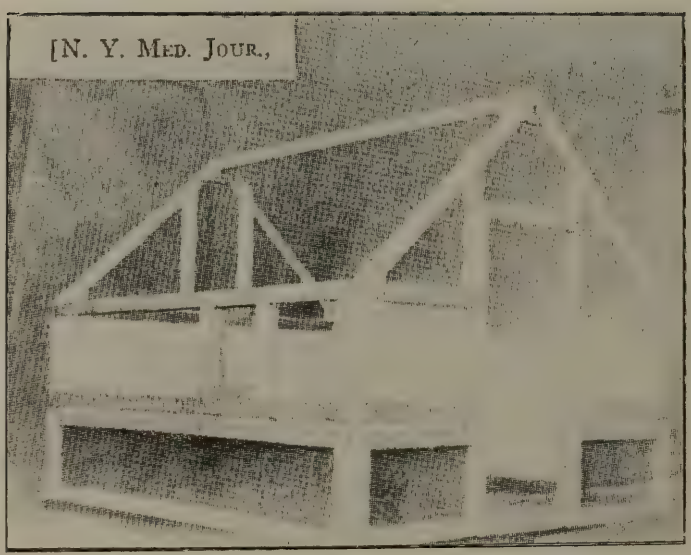


FIG. XIII.—Frame of "tent-cottage"; wainscoting in position. The inner wall of heavy canvas is in position on the front and rear end of right side. The two-inch opening above the wainscoting is clearly shown.

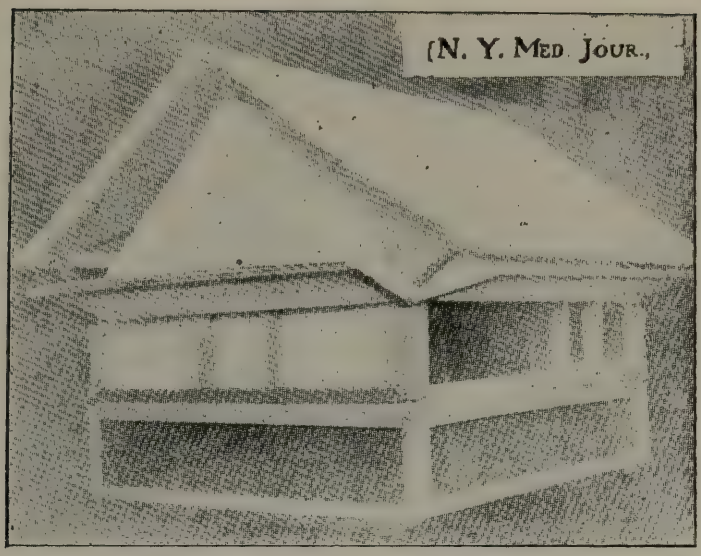


Fig. XIV.—"Tent-cottage" as used in summer. The upper sections of the outer walls are converted into awnings. The rear end shows the inner wall intact. The side shows the upper half of the inner wall lowered, which practically removes the side of the "tent-cottage," converting it into a "tent-pavilion." The same mechanism applies to each side. When thus converted into a "tent-pavilion" the sun can penetrate to any portion of the interior.

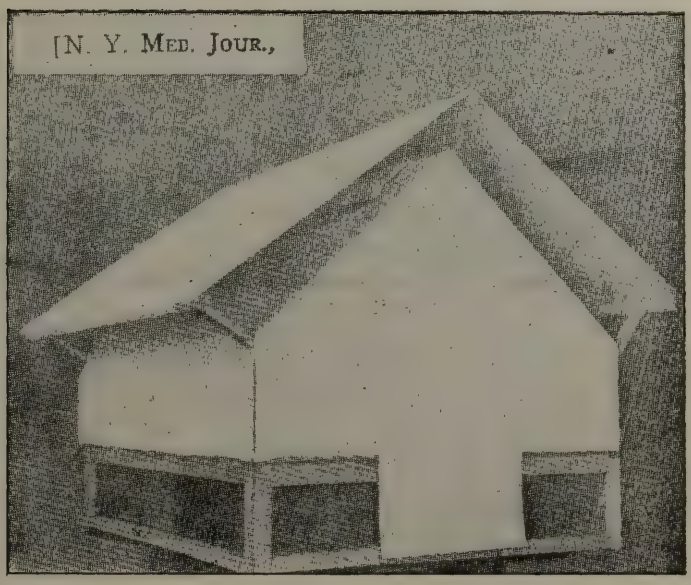
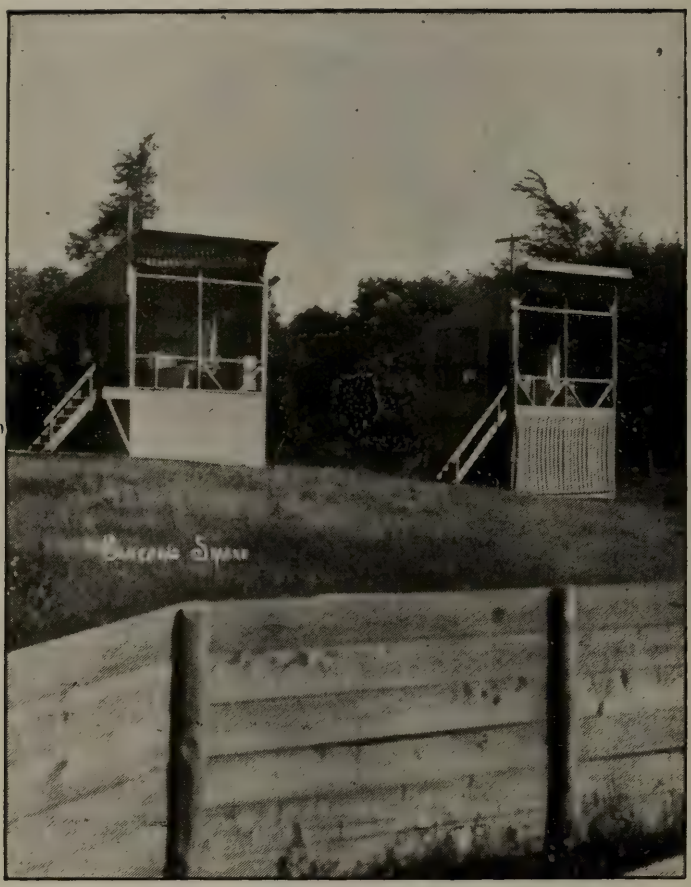


Fig. XV.—"Tent-cottage" as used in winter: the fly intact, the sides and door closed, the roof-window open. The opening between the two sections of the outer wall is plainly shown.



FIGS. XVI. and XVII.—"Sleeping-shacks" for tuberculous patients, devised by Dr. Millet. Note the simplicity and cheapness of construction.

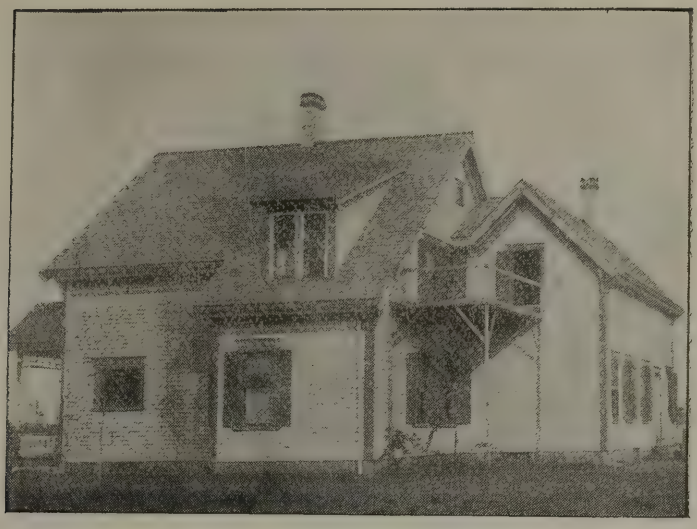


FIG. XVIII.—Sleeping-balcony.

FIG. XIX.—Sleeping-balcony.

FIG. XX.—Roof used as a sleeping-balcony.

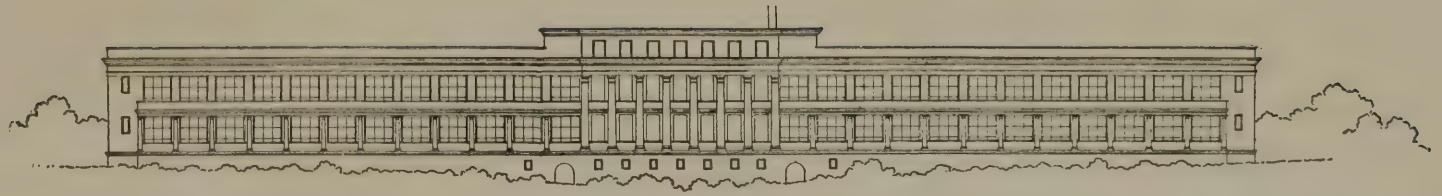
FIG. XXI.—A more pretentious sleeping-balcony.

FIG. XXII.

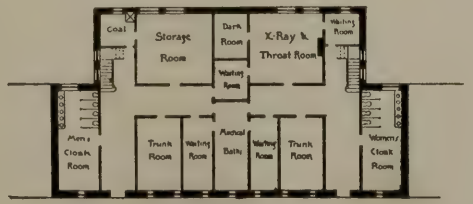
OVERHEARD DURING ONE OF OUR RECENT STORMY DAYS.

"What cheer, Matey! Doin' any Business?"

"Garn! wot yer gettin' at? I ain't 'ere to do Business. I'm takin' the Hopen Hair Treatment!"—PUNCH.



South Elevation

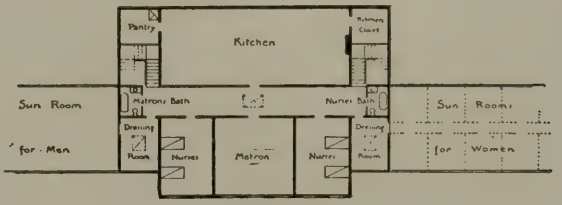


Basement Plan

Proposed New Building for the
Millet Sanatorium for Consumptives
East Bridgewater Mass.

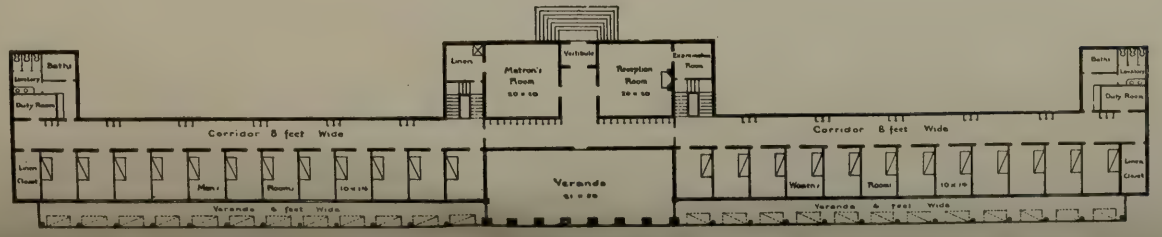
Scale $\frac{1}{16}$ in. = 1 ft.

T. M. Clark, Architect, 23 Congress St. Boston



Third Story Plan

Second Story Plan



First Story Plan

FIG. XXIII.

ARTICLE XXI.

THE SHATTUCK LECTURE.

THE SOURCES, FAVORING CONDITIONS AND PROPHYLAXIS OF MALARIA IN TEMPERATE CLIMATES, WITH SPECIAL REFERENCE TO MASSACHUSETTS.

By THEOBALD SMITH, M.D.

OF BOSTON.

DELIVERED JUNE 9, 1903.

THE SOURCES, FAVORING CONDITIONS AND PROPHYLAXIS OF MALARIA IN TEMPERATE CLIMATES, WITH SPECIAL REFERENCE TO MASSACHUSETTS.

INTRODUCTORY.

After I had accepted the honor of addressing you this evening as Shattuck lecturer, several topics of great interest to me presented themselves. After carefully considering them in the light of the provisions of the Shattuck bequest, it seemed to me that a discussion of Malaria, with special reference to our own State, would at this time be the most useful. I accepted this self-imposed task the more willingly as since 1895 I had been giving much time during the summer months, under the auspices of the State Board of Health, to the study of malaria and the local conditions favoring it. Most of the facts I have personally gathered we owe to this Board; for without their active coöperation the topography of the disease could not have been investigated.

If we were to depict the dissemination of malaria, this scourge of an invasive and militant civilization, upon the globe, we would paint it as a black belt girdling the tropical world and extending its lesser shadows in tongues toward the temperate zones. These shadows become less and less distinct the farther north we go. Though the harm it does to northern civilization is infinitesimal compared with its almost forbidding attitude in the tropics, yet even with us the energy needed for the ceaseless struggle for existence

suffers severely when malaria is invading the blood the integrity of which is so essential to our well-being.

Many things have conspired to bring about a renewed public interest in this disease. First and foremost the stimulus created by the colonial expansion of European nations, next the conditions which paved the way for a scientific demonstration of the existence of an intermediate host or carrier in the mosquito, and lastly the tendency of the intelligent classes in our climate toward suburban and rural homes and the general quickening of all interests in animal and plant life, have enlisted not only the attention of the public but their material support for the suppression of conditions favoring malaria. These various interests are perhaps a sufficient excuse for dealing with the newer aspects of this subject on this occasion. But the greater stimulus to me has been the fact that malaria is a prevalent disease of our State, that it has for us a decidedly sanitary as well as economic bearing. Some overworked and apathetic practitioners in rural communities may perhaps say, " What have the newer developments in regard to malaria to do with us? We can cure tertian fever with quinine and we can with equal readiness cure any relapse." This is true as far as it goes; but it would be a very narrow view to take and would, I feel sure, be spurned by our Society as unworthy of its past record and future promise. There is, however, a concealed, or at least overlooked, misinterpretation here which I cannot pass over in silence.

Medicine's legitimate field of work is not only sickness but health. Medical science has been moving the pivotal point of successful combat with disease more and more toward the well man. Hence we have the two great departments of the medicine of to-day, the curative and the preventive. The latter, the latest to develop, is yearly growing in importance and will eventually overshadow the former; for it is based on sounder biological and economic principles.

Preventive medicine acts in an entirely different way from curative medicine. The latter saves its patient here and there and its services are conspicuous and positive, but the former works only collectively in a negative way and its services are inconspicuous. It also saves lives and prevents disease, but only through cold and dry statistics can it lay any claim to its achievements. It works by slow increments. Like the builder's screws which, placed under a building, raise it through an inappreciable distance each day, so preventive medicine slowly raises the sanitary level, and the total aggregate of all the inappreciable increments means many lives saved and much illness prevented. The study of malaria and the application of the principles underlying it mean no new cures, but a steady elevation of the healthfulness of rural life, the only source of a robust generation.

My task was finally made still easier from the observation I have made frequently of late that among many physicians, engineers and educated people generally, the mosquito has as yet no assured position as a transmitter of the malaria parasite. If our recent developments are to have much value, they must be applied at once, the principles must be made operative and enter intimately into the life of rural populations. We have become now fully cognizant of the hurtfulness of sewage out of place and of sewer gas. In fact our legislative sensitiveness to sewer gas became so great that both capital and labor trusts are said to batten on the severe restrictions created by it. Of how much more definite significance in pathology than sewer gas is the malaria organism! But the history of sewer gas legislation shows what can be done if the public interest is once aroused. Fortunately, the prevention of malaria does not demand such artifical measures as are in use against sewer gas, but only such as will add permanently to the utility and beauty of the land.

THE LIFE CYCLE OF THE MALARIA PARASITE HISTORICALLY AND BIOLOGICALLY CONSIDERED, WITH SPECIAL REFERENCE TO PLASMODIUM VIVAX THE PARASITE OF TERTIAN MALARIA.

The proper presentation of my subject demands at the outset a very brief résumé of the main facts of malaria as known to-day, so that we may be able clearly to apprehend the application of these facts in the framing of preventive measures. The development of our positive knowledge of malaria etiology may be divided into two periods. The first embraces the period from 1880 to 1895 and is chiefly concerned with the study of the malaria parasite in human blood and the clinical interpretation of its various appearances. The second period, extending from 1898 to the present, is concerned chiefly with the sexual reproduction of the parasite in the mosquito and with many questions of immunity and epidemiology.

The facts elucidated during the first period may be considered as already common property of the profession. They are included in all text-books on clinical medicine. All students who graduate from first-class medical schools are able to recognize malaria parasites and are prepared to make a diagnosis with the aid of suitable miscrocopes and accessories. Even many older practitioners have prepared themselves to do the same thing.

A detailed account of the discoveries of this first period would thus be superfluous; but I cannot refrain from mentioning the more important stages in its history, if only as a fresh acknowledgment of the arduous labors of those who were the important contributors. For this first period the excellent detailed historical résumé given by Thayer and Hewetson[1] should be consulted by all those interested in the laborious progress of science as well as its immediate achievements. To it I must also refer the student of malaria for a full bibliography to 1895.

In 1880 the parasite of malaria was first recognized as such by Laveran, then a French military surgeon, stationed in Algiers. In 1885 Marchiafava and Celli in Italy pointed out the possible significance of the segmenting bodies as reproductive phases in the life-cycle of the parasite and insisted upon the fact that the parasites were within the corpuscles and not merely attached to them as Laveran maintained. In the same year (1885) a new observer appeared upon the field in Italy whose researches were, next to those of the actual discoverer of the parasite, the most important as bearing upon the parasite in the blood of man. Golgi described in detail the growth of the microöganism of quartan fever and some years later that of tertian fever. He points out differences between these two parasites at various stages in their growth and first definitely associates the segmentation with the paroxysm. He shows that quotidian fevers are due simply to two or three groups of parasites maturing on different days. Henceforth the microscope would enable the skilled observer to make a diagnosis between tertian and quartan fever, to recognize quotidian types and to approximately fix the time of the paroxysm. This great advance did not include in its scope what we now know as the more dreaded æstivo-autumnal or tropical fever, a type of malaria practically unknown in New England, excepting as it may be imported in isolated cases. Councilman was one of the first to insist upon the association of certain forms of parasites with the more irregular and continuous fevers. In 1889 Marchiafava and Celli and Canalis headed a long series of investigations upon this third type of fevers. This is not the time to recount the many shades of opinion, the many and diverse classifications into distinct varieties of the æstivo-autumnal type as the result of laborious investigations. In brief, it may be stated that the tendency is to regard the varieties of this third type of fever as a unity to-day.

With the middle of the last decade the study of the ma-

laria parasite in the human body seems to have exhausted itself. As is the case where the microscope is the only tool, interpretation is difficult and there is always danger in the framing of hypotheses from what we see that we may put the cart before the horse as either method usually satisfies appearances. The stimulus which was to bring renewed life into this subject came from several different directions and with their aid the end the century saw revealed one of the most interesting biological phenomena, in which three different organisms combined to complete what is in many respects a most vicious circle for one of them. The second period presents a congestion of interesting details from several distinct sources. These details are not yet widely known and an historical survey would be misleading. The simplest method which presented itself to me was to give a very concise sketch of the tertian parasite as it is known to us to-day and then refer briefly to the sources contributing the fertile hypotheses.

The parasite of tertian fever in its earliest stages appears within the red corpuscle either as a small ring or as a body consisting chiefly of slender filamentous prolongations or pseudopodia. Examined fresh, it exhibits amœboid movements most active at the temperature of the blood. Soon reddish brown pigment granules begin to appear which increase in number with the size of the parasite. Before the end of forty-eight hours the parasite has grown as large as the host-cell and the latter may be still seen in faint outline or it may have completely disappeared. At this time signs of segmentation appear. The pigment tends to gather into a more or less compact mass in the centre, and the parasite separates into from twelve to twenty-four small nucleated bodies, the so-called spores of the older writers, the merozoites of the present. These small bodies again enter red corpuscles, where the same process is passed through to the stage of segmentation or schizogony. The latter is associated with the paroxysm as already determined by Golgi.

This process of asexual reproduction is the one which is mainly responsible for the symptoms of disease. It destroys red corpuscles and the fever induced may be due either to the corpuscular debris or perhaps more reasonably to the foreign substance of the parasite set free or left behind when the merozoites break away from the mother parasite to begin life anew.

After a certain time, as yet indefinitely known, the process takes another direction. The young merozoites after entering red corpuscles, instead of growing into the segmenting bodies described above, develop into forms which closely resemble those bodies, but which do not segment. They are the male and female elements concerned subsequently in the body of the mosquito with sexual reproduction. The female body is known as macrogamete, the male as microgametocyte. These three individuals, the segmenting body or schizont and the male and female bodies, have been recently distinguished from one another by Bastianelli and Bignami,[2] Grassi,[3] and more in detail by Schaudinn,[4] who gives a number of differential characters pertaining to the structure of the nucleus, the cytoplasm, pigment, vacuole and time of growth of the sexual and asexual individuals. In other words, with proper methods of fixation and staining the skilled observer can determine at an early stage of the intra-cellular parasite to what cycle it belongs.

Leaving aside as somewhat beyond the scope of this lecture the characters of the sexual elements or gametes I may simply state that they develop into bodies which slightly exceed those of the adult schizonts. While the latter rarely exceed 10 mm. according to Schaudinn, the former may become twelve to sixteen mm. in diameter. When they have reached this stage no further changes occur until they have been drawn into the mosquito's stomach. It should be stated, however, that when freshly drawn blood is watched, further changes do occur in the male body, which consist

in the extrusion of spermatozoa or microgametes, the so-called flagella of earlier writers. This extrusion is probably brought about by conditions simulating those in the stomach of the mosquito.

The life cycle of the malaria parasite thus comes to a standstill in the blood of man after a certain time to be completed in another host. In the blood drawn into the mosquito's stomach the two sexual elements or gametes rapidly complete their development. The male element extrudes four to eight flagellate bodies or microgametes which are from $2\frac{1}{2}$ to 3 times the diameter of a red corpuscle in length. These move and lash about actively, tear themselves away from the parent body, and move through the fluid. One of these penetrates into a macrogamete. This process of fertilization is similar to that of higher forms. The male element, composed largely of nuclear matter, unites with the nuclear matter of the female element to form a new nucleus.

The fertilized female body after about ten minutes begins to push out a hyaline prolongation which gradually grows until the entire body has assumed a worm-like form. This little worm (oökinet) begins at once to seek its future abiding place where it is to produce the countless infecting sporozoites. It penetrates the epithelial layer of the stomach and comes to rest beneath the external elastico-muscular tunic of this organ. In this situation, the parasite slowly grows larger and as it grows bulges the external tunic of the stomach, which forms its envelope, outward into the body cavity. Up to five hundred of such bodies may, according to Grassi, develop in the stomach walls of a single individual. Their final size varies more or less according to external temperature and food supply. During the enlargement of these bodies profound internal changes are under way. The fused nucleus of the original oöcyst undergoes repeated division. The new nuclei become the centres

of irregular masses, the sporoblasts. Each new nucleus again subdivides into an indefinite number of minute nuclei, which appear on the periphery of the irregular masses, or sporoblasts, and there by gathering about them cytoplasm, they eventually form the myriads of fusiform bodies known as sporozoites. These when mature become detached from the mother mass, and when the cyst bursts they enter the body cavity. They are very slender bodies, on a average 14 mm. long and between 1 and 2 mm. wide in the middle. They possess the power to change their form as well as to move. After their discharge into the body cavity, some attraction draws them to the salivary glands, which they penetrate and where they imbed themselves in the secreting cells and in the lumen of the gland.

These slender mobile organisms (sporozoites) are discharged into the blood of man when the proboscis of the infected mosquito penetrates the skin and reaches a vessel. Schaudinn recently described the entry of two of these bodies into red corpuscles as observed by him through the microscope. Within the red corpuscle each body begins the life cycle anew.

The time required for the formation of sporozoites in the mosquito varies with the temperature. According to Grassi the shortest period is about ten days. Allowing, according to the same observer, about ten days between inoculation by the mosquito and the appearance of the fever, at least twenty days would elapse after a mosquito had become infected before another case would appear.

We have now sketched, in bare outlines, the life cycle of the malaria parasite and with it the mode of transmission of the disease from man to man. As I stated before, the unraveling of this wonderful chain of events was not accomplished by one man, but a number of contributors have assisted in interpreting this wonderful bit of parasitism.

The germs of hypotheses concerning the mosquito have

been traced well back.* In 1882, A. F. A. King advocated the mosquito theory on the basis of general epidemiological facts.

Manson, in 1894, declared for the mosquito as transmitter. The mosquito draws the parasites into its body with the blood. There spores are formed and when the mosquito dies they are shed broadcast in the air and the water and we become infected when we inhale or ingest them. His hypothesis was evidently suggested by his important work on Filaria.

In the experimental studies upon the malaria of cattle, known popularly as Texas cattle fever, the writer,[5] in association with F. L. Kilborne, after four years of nearly continuous investigation arrived at certain conclusions in 1893 which have been the forerunners of the well-established principles governing human malaria.

The blood parasite in this affection lives within the red corpuscles. The ectoparasite which draws it out of the body is the Southern cattle tick (Boöphilus bovis, Curtice). But the process of transmission is more complicated than that for malaria discovered over five years later. The mother tick which draws the blood and in it the parasite into her body never attacks another animal. After having gorged herself with blood designed for the nourishment of the ova, she drops to the ground, deposits a large number of eggs, and dies. The young larvæ, emerging from the eggs after three or four weeks, attach themselves to cattle and in doing so inoculate the blood parasites transmitted to them by their mother. It will thus be seen that nature had to provide for the infection of an unborn generation of ticks in the body of the mother tick in order to have the malaria parasite transmitted to other cattle. When this complicated mechanism for the transfer of a minute blood parasite came

* For a full historical résumé, including bibliography, we are indebted to George H. F. Nuttall.—Johns Hopkins Hospital Reports, Vol. VIII.

to light after two years of experimentation, it seemed so wonderful that it staggered my belief in the etiological rôle of the bovine malaria parasite, and new experiments had to be tried to make this wonderful mechanism credible. The malarial organism was soon rehabilitated however, when we found that the disease could be produced without the aid of the cattle tick by simply inoculating with the blood of cattle carrying it. It could also be shown that the disease could be produced at a distance by simply importing adult female ticks from an infected locality, breeding the larvæ from the eggs and putting them on susceptible cattle. I speak of these experiments because they completely refute the hypothesis occasionally presented that the mere sting or bite can produce disease by a process akin to poisoning and because they illustrate the symbiosis existing between the cattle and the blood parasite on the one hand and the blood parasite and the cattle tick on the other.

Here we have the first actual demonstration that ectoparasites drawing blood inoculate the virus when they sting. It remained too strange a fact to be properly accepted, but it slowly began to stimulate students of human malaria as shown in their references to the implied analogy. Notably the Italians were impressed with it, and without doubt the fact that Koch[22] in 1898 was able to repeat and confirm the experiment upon cattle in Africa led him to attack the malaria problem with his usual energy. In the mean time Ross[6] working in India had, in 1898, practically worked out in certain mosquitoes the cycle of bird malaria which subsequently proved to be nearly identical with the cycle as observed in human malaria. Ross is therefore the one to whom the credit for demonstrating the malaria cycle belongs.

But there were other contributing sources which were essential to an understanding of the significance of certain forms of the malaria parasite. Since Laveran's discovery in 1880 it was known that certain large forms of the

malaria parasite, when the blood containing them was watched under the microscope, extrude four or more delicate filaments which are actively motile for a time. There were also the peculiar crescent-shaped forms in the blood in the tropical fever which puzzled observers. Both the flagellate and the crescent forms were variously interpreted as degenerations and their significance wholly misunderstood. In 1897, McCallum[7] in the study of bird malaria grasped the true significance of these forms when he saw under the microscope the flagellum of one form penetrate into another.

The sexual process here observed at once gave a new significance to these neglected, misinterpreted flagellate bodies, and to the crescents which we now know as the gametes and which carry on the life of the malaria parasite in the mosquito. At the same time studies by Simond[8] in France on related sporozoa known as coccidia, revealed the presence of peculiar structures which were speedily identified as male sexual bodies. These two converging lines of experimentation, the demonstration of the transmission of malarial disease by the prick of arachnids in cattle and by mosquitoes in malaria, and the disclosure of sexual phenomena in the malaria of birds and in the coccidia, enabled such skilled observers as Grassi in Italy, Koch in Italy and the tropics, Ross in India, and a host of others, to perfect the details of proof and give them weight before the uninitiated and incredulous multitude of professional and lay lookers-on.

There remained still one problem to be disposed of. The universality of the mosquito and the restricted areas of malarial infection are so clearly opposed to one another that the new facts could hardly be expected to make headway without further work. The many species of mosquitoes, rising into the hundreds, cannot all be concerned in this vicious circle. To Grassi more than to any other belongs the credit of having called attention to the genus Anopheles as the

intermediate host of human malaria. So far there seem to have been no developments to contradict Grassi's work. Not only he, but the English malaria expeditions, and quite recently Schüffner,[9] have traced the parasite of human malaria through certain species of Anopheles. At the same time it is not to be inferred that all species of Anopheles are necessarily carriers, as I shall point out later on, and that in any locality the prevailing species should be tested with reference to this point.

It is interesting to note that one kind of bird malaria (*Proteosoma*) seems to be transmitted by certain species of Culex. Of the other widely distributed form of bird malaria (*Halteridium*), the intermediate host remains unknown.

It would be idle for me to assert that with the discovery of the sexual cycle of the human parasite in Anopheles all the vexed questions concerning the epidemiology of malaria had been disposed of. On the contrary, we have just begun to appreciate the sure footing gained and we must now begin to study those elusive variations in the disease due to latitude, climate and seasons, and to racial diversities without which practical measures for the eradication of malaria from any given territory can have but little assurance of ultimate success. It is with special reference to these many variable factors that I venture to present the subject tonight.

THE RELATION OF THE TERTIAN PARASITE TO THOSE OF THE QUARTAN AND THE ÆSTIVO-AUTUMNAL OR TROPICAL FEVER.

It is now well known that there are three species or morphological types of malaria parasites. The tertian and quartan parasites were first distinguished by Golgi, the æstivo-autumnal somewhat later. The distribution of these three forms and the existing controversy whether they are

distinct species or manifestations of but one under different conditions, bring them necessarily within the scope of our subject.

Concerning their distribution it may be briefly stated that the æstivo-autumnal or tropical parasite has its home chiefly in the tropics and extends thence into the adjacent belts of the temperate zones. The quartan parasite has nearly the same distribution, but it is only rarely encountered. The tertian parasite is more cosmopolitan. It is found both in the tropics and in the temperate zones.

A majority of observers are agreed that the three forms are distinct, while a minority are of the opinion that the three forms really represent one species and that a different environment and perhaps different degrees of immunity account for the different forms. This is not the place to enter into a description of the three types or forms. Good descriptions will be found in Thayer and Hewetson[1], Ewing[10], Ruge[11], and others. Suffice it to state that certain differences between them are thoroughly well established. Among them are the crescents (gametes) of æstivo-autumnal fever which are not found in tertian and quartan fevers. The tertian parasite attains a larger size than the quartan and the red corpuscle is swollen and pale. In the segmenting stage twelve to twenty (Thayer), or fifteen to twenty-five (Ruge) spores (merozoites) are set free, whereas in quartan infections only six to twelve spores are formed. There are also differences in the form of the pigment.

The æstivo-autumnal parasite differs from the tertian and quartan not only in the presence of crescents, but also in the absence of sporulating forms in the peripheral blood. The forms there found are rings, at first very minute, then larger. These finally disappear. The segmenting stages are found in the spleen, bone, marrow, brain, etc. These differences, and others not mentioned, upon which observers working in different continents on the whole agree, appear

sufficient to justify the establishment of three species of malaria parasites. Yet there are good reasons for not considering them impregnable. Assuming for the moment that they are independent organisms, we must meet the interesting fact that in our State and in others similarly situated only the tertian parasite is found. In the many specimens from various towns examined microscopically by me and my assistants, the æstivo-autumnal species was not recognized as such in any case. Though many soldiers returning from the Cuban campaign brought this form in their blood, no indigenous cases seem to have occurred as a result of this importation. Recently some evidence has been presented to the effect that the æstivo-autumnal type of fever is gaining a foothold about New York City. Jackson[12] reports four cases at West Point, only one of which was imported from Cuba. Peabody[13] describes the same disease in a man who during eleven years was only once out of New York. He went to Pennsylvania three years ago and was away four days. Patterson[14] thinks that this type began to appear since 1898.* If we maintain that the æstivo-autumnal and the tertian parasites are distinct and independent organisms, we are obliged to support as a corollary one of several propositions. 1. The transmitter of the æstivo-autumnal fever is wanting. This is not improbable even with *A. maculipennis* among us; for the crude external species characters may be the same as those in the South, yet the physiology of the insect may be decidedly modified by a colder climate. 2. The mean temperature with us is too low to successfully mature the tropical parasite in the mosquito. 3. The difference in temperature and other meteorological factors are sufficient to repress and suppress this parasite in the blood while we live in this climate. Some of the soldiers who came from the Cuban war affected with malaria showed at

* I subsequently found that Ewing had reported another case in Journ. Exper. Med., 1902, vi. p. 120.

first both æstivo-autumnal and tertian parasites in their blood. Later on, the former disappeared and the latter remained in some cases producing relapses. This disappearance of the graver type of infection and the persistence of the milder type was noticed by Ewing[10] in the military camp at Montauk, N. Y. Does it mean that the soldiers were infected with two parasites at the outset, or did the æstivo-autumnal assume the tertian form in the northern climate?

The question is of great interest and importance, yet there is singularly enough no decisive argument which can be applied to definitely settle it one way or the other, although the preponderance of observation and experiment is in favor of the pluralistic view. This has been well summarized recently by Ruge.[15]

CONDITIONS UNDER WHICH THE HUMAN BEING MAY BECOME SOURCE AND CARRIER OF MALARIAL INFECTION.

Our present position as regards the etiology of malaria demands at least two links in the chain of causation. If one is absent the disease must fail to appear. They are:

1. Infected human beings.
2. Mosquitoes of the genus Anopheles.

In order to discuss intelligently the relation of human beings to the dissemination of the disease, it will be necessary to recall the fact already described that in the fresh attack the asexual multiplication of the parasite goes on in the blood for a time. Then sexual forms appear which I think are best interpreted as indicating a beginning of immunity. The mosquito can be infected only through the sexual forms. The important question before us is the relative danger as a source of malaria parasites of the infected person who comes from, or lives in, the region usually free from malaria and of one who comes from a region in which malaria is endemic. An attempt to discuss this complex question requires a brief statement of the new doctrine of acquired immunity in malaria.

This was brought distinctly before us by Koch[16] in the reports of his work in the tropics. The idea that immunity can be acquired toward intraglobular parasites was not new, however. It was shown by myself and Kilborne that immunity is acquired toward bovine malaria, and this fact has been widely exploited in our country to prepare cattle for importation into endemic regions where susceptible animals usually die. In investigations made in East Africa and New Guinea, R. Koch came to the conclusion that malaria is very prevalent in young children, but that it gradually disappears with age and that the adults have acquired immunity. In them the enlarged spleen and other concomitants of malaria have disappeared. A. Plehn[17] disputes the latter as not in harmony with facts and cites his own studies of the blood of adults as well as the examination of the spleen to show that they too suffer to a considerable degree with malaria. The point I wish to bring out does not concern their controversy, but their essential agreement upon the great prevalence of malaria in children. Plehn, who made careful observations upon this subject, states that while the youngest children may have numerous parasites in their blood, their general condition remains undisturbed and temperature elevations are uncommon. The same is true of many adults of whom Plehn found about fifty per cent. carrying the malaria parasite without the, to us, familiar clinical disturbances. Christophers and Stevens[18], in their work under the auspices of the Royal Society of England on the west coast of Africa, in India and other regions in the tropics, find that a large per cent. of the native children have parasites in their blood. There is a gradual disappearance with age. After the age of twelve infection is rarely demonstrable. The disease is always mild.*

* "It must be understood that in speaking of a case of malaria in children we are referring only to the presence of parasites; the children are perfectly well and present none of the characteristic signs observed in Europeans affected with malaria." (Lagos, West Coast of Africa.) See Rep. to Malar. Committee. Third Series.

Annett, Dutton and Elliott[19], of the Liverpool School of Tropical Medicine, observed in Nigeria the extensive infection of children. Christophers and Stevens regard this pheomenon of such importance that they base upon the infection of children the prevalence of the disease, or what they call the "endemic index" in any given locality.

Though Koch has been severely attacked for his hastily formed doctrine of immunity, more particularly by Glogner[20] and Kohlbrugge,[21] there can be little doubt that the available data derived from human and comparative sources agree with this doctrine. A distinction should however be made between what I prefer to call clinical immunity and biological immunity. An individual may have acquired a considerable degree of biological immunity, but owing to the effort required and the resulting loss of tissues he may come out of the struggle badly off. This must not shut our eyes to the fact, however. In this protean variation of disease due to the struggle between two variable organisms we must clearly keep in mind "Den ruhenden Pol in der Erscheinungen Flucht" even if it does not always help us cure the patient. The same principle which meets one patient on its downward curve and destroys him, meets another on its upward curve and saves him. We must study the curve and learn where the patient fits it, and where and how to apply assistance.

The general observation in tropical malaria that children are the chief objects of attack, that it is in fact a children's disease there, is another proof of the general doctrine of acquired immunity, for in nearly all endemic infectious diseases the virus attacks by preference the young because immunity protects adults.

The subject is, however, still more complicated. It would be folly to transfer the doctrine of immunity from natives of Africa to natives of our northern climate settling there. The former do not acquire all their immunity in a

single life time. They start at birth with enough inherited accumulation of immunity to need but a little further training to come out victorious. That the Anglo-Saxon baby could do likewise is hardly within the range of probability.

The difference between the native of the tropics and native of the temperate zone is probably dependent on a variety of physiological factors. Among these I am inclined to place differences in the biology of the red corpuscles at the front. The red corpuscle is subject to much greater vicissitudes as regards osmotic changes in the tropics than in temperate zones. With us, temperatures below a certain mean are equalized by clothing and artificial heat. Temperatures above a certain mean are not equalizable. They must be endured. Hence the heat-regulating mechanism must come into more active play, the output and intake of water is large and with it the changes in the concentration of the salts of the blood must vary more or less. The native of hot climates is adapted to these changes, primarily by a greater resisting vigor of the red cells. The temporary resident of the tropics suffers from those disorders incidental to the taking care of corpuscular debris, foremost among which are those of the liver. Added to this natural increase in the resisting power of the red cells is one due to increased use such as takes place when new corpuscles must replace those destroyed by use and by malaria parasites. The blood-forming organs up to a certain point are strengthened by use.

Secondly, a specific immunity due to the malaria parasite itself must accumulate through generations in infected localities, which immunity may reside both in the blood and in the host cells themselves. This subject of the relation of the red cells to immunity I can only touch upon here. It is one which I think will repay thorough investigation.

In the malaria of our latitude, the effect of the parasite upon natives and those coming from still colder climates is

not seen in its frankest manifestations, because quinine enters at once to suppress the disease. When treatment is neglected cases do occur now and then which indicate that malaria freshly introduced into a locality may prove serious and even fatal at times.*

In our climate the French Canadians appear to be most susceptible, and in general it seems to be true, as with yellow fever, that the further north the home of the one who immigrates into an endemic region the more severe the disease when it does appear.

A similar relation between latitude and susceptibility seems to exist in bovine malaria. The disease imported into the northern states from the southern enzootic territory, though carried by healthy animals in their blood, is very murderous to the northern animals. On the other hand, cattle living in the tropics, but not in infected localities, are much more resistant as indicated by Koch's experiments in Africa. The same seems to be true of the Venezuelan form of this disease, called Lomadera, and studied by Ziemann.[23] All that can be claimed from various observations upon immunity is that the influence of the malaria parasite upon the host is in the direction of a biological immunity. The latter may or may not reach a clinical immunity, for that would depend upon the degree of resistance with which the individual started in life, and the interruption of the process by the continued use of quinine.

During the immunization which goes on in the course of the manifest or latent infection, how early do the fully matured gametes appear, and how long do they remain in the blood? After fresh infection does the highly immune body destroy the injected sporozoites or do they form

* In one town a young woman who was being treated without quinine told me that she had had thirty-six chills in thirty-nine days. An examination of the blood certainly confirmed her statement, for the disease had produced marked anæmia and characteristic changes in the red cells.

gametes? These questions are proposed in view of their bearing upon the infectiousness of the individual in different stages of the disease. Schaudinn, who states that with suitable methods gametes of tertian fever may be readily detected in the blood and distinguished from the schizonts or sporulating forms, has seen the former appear in one case after the third attack. But Schaudinn made his studies in a permanently infected region on the eastern coast of the Adriatic in Istria. Thayer and Hewetson have given summaries of their observations of the sexual forms of parasites, and from their report I take the following figures. In one hundred and fifty-three cases of tertian fever, flagellate bodies were seen in six. Of one hundred and five cases of æstivo-autumnal fever they were seen in eighteen. "In an half of the cases the paroxysms had ceased; in eight out of twenty instances quinine had been previously given; that is, for days and sometimes for weeks after the activity of the infection had certainly been overcome, we were able to see flagellate bodies . . . . . ."

In the case of the crescents, the gametes of æstivo-autumnal fever, they found in over seventy per cent. of the cases the crescents appearing in the second week or thereafter, practically none in the first week, if two doubtful cases are thrown out (p. 173). It seems that the gametes tend to appear after the more active process has subsided, and if the conditions where these cases were studied are similar to those in our latitude we may assume that patients may be infectious in the presence of Anopheles during and after the second week. However, I am not inclined to accept fully the findings of the latitude of Baltimore or Istria for Massachusetts.

G. Maurer, studying tropical malaria in Sumatra, states that gametes appear in the blood only some time after the beginning of the fever, in some earlier than in others. In some they do not appear at all. The appearance of cres-

cents is completely suppressed when the earliest fevers are treated rationally with quinine.

There are a number of factors working against the ripening of gametes in the blood in natives of our climate. These are the absence of any inherited or acquired immunity to begin with and the prompt use of quinine. Cases may, however, remain untreated. They may possess more or less natural resistance. Even cases treated successfully in one season may have relapses in the early spring of the following season. Such cases are probably much more likely to prove sources of infection than fresh cases. In them immunity has made some progress. These relapsing cases are probably the starting-point of the infection during the year.

The most dangerous individuals are those who have lived in permanently infected localities for a long time and who possess considerable resistance. In them the virus is latent and prepared to appear clinically under satisfactory provocation. Caccini[25] made an exhaustive study of the latent virus of malaria in Italy and the causes of its occasional outbreak into a paroxysm. He found that the general condition of the people was of considerable moment. The well-fed and well-housed masters had few attacks as compared with the laborers under them. Heavy work during the vintage and harvest, gastro-intestinal troubles, a sudden chill, sleeping out of doors, being caught in rains, all predisposed to relapses. Certain foods causing vomiting, certain medicines, intercurrent illness, even sea-bathing, brought on an attack in some persons. It is related by A. Plehn[26] with citation of cases that persons, having had no clinical disturbance in the tropics during a temporary residence because of prophylactic quinine treatment, on their return to Europe passed through a regular attack either on ship-board or in their native country. In such instances the infection occurred unperceived and may have been repressed by quinine from the start.

Though the conception of the latency of malaria is a very old one, yet its epidemiological significance has had no recognition until lately. The persistence of malaria has been chiefly of clinical interest, and the patient was considered, rather than his environment. To-day we are slowly becoming accustomed to the thought that the latter must also be considered. Absence of illness does not necessarily exclude the presence of infecting organisms and carriers of infection must be kept in view as possible centres of disease. We are now fully acquainted with the possibility that bacteria may persist in the body after recovery. The vexatious question of diphtheria bacilli in recovered cases is present without doubt in the minds of most physicians. In typhoid fever the urine and feces may contain the bacilli after recovery. I might give many additional illustrations. But there is another fact of similar significance, namely the presence of pathogenic bacteria in the well who have come in contact with infection. Thus, typhoid and cholera microbes have been found in the feces and diphtheria bacilli in the throat of well persons not previously diseased. This tendency toward a symbiosis between host and parasite is much more pronounced in the case of animal parasites especially those belonging to the malaria group. Thus in bovine malaria the parasite has been demonstrated by inoculation to exist in the blood of immune animals three years after the last opportunity for infection.[27] More recently Wasielewski[28] has shown that one of the malaria parasites of birds (*Proteosoma*) remained in the blood five months after infection. The more favored theory would undoubtedly be that when the host becomes completely immune, the blood parasites can no longer subsist in him, but I am inclined to believe that such complete immunity does not exist and that whenever an immune human being is infected the parasites go through the process of forming gametes or sexual elements without clinical manifestation and then await the opportunity of being withdrawn

by some mosquito. Or else they await the equally desirable moment when the host has committed some indiscretion by which his resistance is reduced when the parasite rapidly undergoes the usual asexual multiplication in the blood and calls forth a paroxysm. When equilibrium is reestablished the sexual elements appear in large numbers. The forms in which the malaria organisms remain latent is a subject of great biological interest. Grassi assumed that sexual elements or gametes undergo parthenogenesis. Schaudinn recently claims to have established the fact that the gametes may revert in part to forms which multiply asexually in the way familiar to us whenever a relapse is impending.

Whatever may be the biological process, to us its significance is summed up in the possibility of infecting the mosquitoes.*

Without doubt the parasites are so few in the blood in the clinically recovered or the immune cases that only a small per cent. of the attacking Anopheles would infect themselves. The most favorable time for such infection would be at the end of a relapse or a fresh infection when a large number of the parasites would become gametes and thereby capable of continuing the cycle in the mosquito. The attacking mosquitoes would at this stage find plenty of gametes and the danger of creating a focus would be at its maximum. It will be seen that I am putting the burden of starting new foci of malaria and of awakening the disease in the spring upon the older, latent or partly immune cases, who are in that stage of immunity which readily produces gametes after a relapse.

The transmission of sporozoa seems to be accomplished chiefly through the agency of recovered cases. *Coccidium*

* To me the simplest explanation which has suggested itself is that during the period of latency the parasites multiply as they do during the clinical outbreak, but more and more slowly, and in fewer numbers. Each sporulation is drawn out, in time as it were, and leads finally to the formation of gametes.

oviforme of rabbits is handed down from parents to young. This is probably the case with one form of bird malaria due to *Halteridium danilewskyi*. Some years ago I examined in this vicinity the blood of four young crows belonging to the same brood. In one of them the malaria parasites were very numerous. The others were not infected. I examined the blood of the infected bird day after day without seeing any forms indicating multiplication. When a drop of this blood was examined with high powers of the microscope, a considerable number of the largest parasites would rupture the red corpuscle in about two minutes and a half, assume the form of spheres, and throw out a number of flagella. The parasites were all gametes or becoming such.* The infection of the young bird which had not yet left the nest came probably from the parents through some ecto-parasite. In their blood the parasite was probably in a "latent" condition.

The surest way of testing the infectiousness of persons freshly attacked, those who have passed through several seasons of malaria and those who have grown up where malaria is endemic is to determine from what class of cases mosquitoes can infect themselves. It should also be thoroughly ascertained to what extent infection is possible in the latent stage. Experiments made for this purpose by endeavoring to infect mosquitoes have been reported from various countries. The precise history of the cases from whom mosquitoes drew blood is not given and in most instances the experiments were made in localities more or less permanently under the influence of malarial virus. Bignami and Bastianelli refer to a patient with crescents in his blood who successfully infected *A. claviger* and *A. superpictus*. Grassi succeeded in infecting Anopheles from a patient whose blood was full of crescents. W. S. Thayer[29] reported in 1900 a slight infection of *A. maculipennis* after feeding on a case

* The asexual stage of this parasite is not known.

of tertian and one of æstivo-autumnal fever. Woldert[30] writes of one infection after many negative trials with the æstivo-autumnal parasite. Similarly, Berkeley[31] refers to one infection out of sixty dissections. Van der Scheer and Berkelom[32] in an endemic locality in Zealand (Denmark) found that they were able to infect Anopheles when the blood contained gametes, but not when quinine treatment had preceded the experiment. Manson's son was successfully infected with mosquitoes imported from Italy which had fed upon the blood of a case of benign tertian fever.

It is evident that the infection of mosquitoes is not an easy matter and frequently fails. These failures may be in part due to the mosquito, but I am inclined to believe that they are largely due to the patient not being ready to furnish satisfactory gametes. Grassi[3] (p. 115) makes the significant statement that "there are persons who though their blood contains gametes are not capable of infecting Anopheles. These gametes . . . . . are sometimes too young, more often they appear too old, or perhaps the suspected parthogenesis which leads to relapses has already been started." It is quite obvious that the large amount of painstaking work which has been done in studying the transmission of malaria is only the beginning of more detailed and thorough work to be done not only in the tropics but in those localities in our climate where malaria is trying to obtain a foothold, but has not yet fully succeeded.

The persistence of the malaria parasite in the blood explains not only the dissemination of malaria by human beings, but it also throws a strong light upon the many theories formerly held concerning the source of malarial infection. The so-called hydric theory which regarded bad drinking water as a source of infection is quite prevalent in the South. When a person drank bad water, upset his digestive system and had an attack of malaria as a result, the inference that the water introduced the germs was a natural

one. We know, however, that such digestive disturbances simply give the latent virus an opportunity to multiply by temporarily breaking down protective barriers as shown by the exhaustive statistical studies of Caccini. Summing up the evidence concerning human beings as carriers of malarial parasites and as sources of infection, we find that there is no definite information at hand as to the time when affected individuals may infect mosquitoes. Data from various sources including comparative pathology favor the view that human beings are not at once infectious, but that this capacity comes with prolonged parasitism and that it may be retained indefinitely.

MOSQUITOES AS INTERMEDIATE HOSTS OF MALARIA.

To follow the intricate processes of the immunization of man during malaria and their bearing upon infectiousness of the patient can have only a secondary value with us even if it were possible to say at what precise moment the mosquitoes may become infected by drawing blood. The healthy individual even though dangerous should not be restrained if the suppression of malaria can be accomplished in other ways. This leads me to the second link in the etiological chain—the mosquito. The relation of mosquitoes to malaria as carriers became a definite working hypothesis with me in 1896. In 1897 I devised a set of questions for use in the investigation of local epidemics, among which those concerning mosquitoes and the relative exposure of individuals to them were prominent. The hopelessness of making any progress in this subject in a latitude usually free from malaria and only sporadically invaded by it soon became evident. The sequel showed the reasonableness of this state of mind. Not a single fact of fundamental importance in the etiology of malaria has been discovered outside of the endemic foci and the most valuable studies have been made in the heart of the tropics. There are, however, minor prob-

lems pertaining to local conditions which can be solved perhaps better in our latitude than farther south.

Basing ourselves upon the work of Grassi and those who have followed him, we include only the genus Anopheles among the intermediate hosts of the malaria parasite. In our State two species of this genus are widely disseminated and encountered in many localities. These are *A. maculipennis* and *A. punctipennis*. The introduction of these species into Massachusetts is not known. They are, however, not a recent acquisition. Dr. C. S. Minot[34] found larvæ identified by Mr. Burgess as Anopheles in ponds of the Forest Hills district in 1880. Which species they represented is not known. By far the most prevalent and most numerous species is *A. punctipennis*. It is as large as the large Culex species and is particularly conspicuous on account of the yellowish-white spots on the wings and its peculiar position when resting. The adult female, leaving its hiding places in the early spring, measures (excluding proboscis) 5 to 6 mm. in length. The life history differs only in unimportant details from that of the genus Culex. The aquatic larvæ after a period of two or more weeks, depending upon the temperature and food supply, enter the pupa stage. In this they remain about three days and then emerge as sexually mature insects. *A. punctipennis* may be encountered on the wing from March until late in November. In 1902 I encountered a number of females on March 22 when they vigorously attacked me. In 1903 they did the same thing, March 14, a very warm day. Even in mid-winter they may be seen about houses when they have been driven from their hiding places by workmen.

The larvæ, as is now well known, differ from those of Culex in lying horizontally just below the surface of the water with the short air-tubes on the eighth abdominal segment at the surface. They vary more or less in coloration

from a light to a dark green. White dots along the dorsal median line of the abdomen may or may not be present. The largest are about 6 to 7 mm. long. During the summer of 1902 I spent much time in the effort to find some means of distinguishing the larva of *A. punctipennis* from that of *A. maculipennis*, but thus far without success. This may have been in part due to the fact that the latter were quite scarce. The pupæ of the two species of Anopheles differ very slightly from those of Culex. The shorter breathing-tube in Anopheles, as mentioned by Howard[35] has served me well in recognizing them.

A. punctipennis I have found either in the larval or the adult form in different parts of our State. The larvæ were taken to the laboratory and there the development into the adult insect was watched in order to make sure of the species. In this way I have collected or bred *A. punctipennis* from various regions of the Boston district (Forest Hills, Jamaica Plain, West Roxbury near Charles River, Faneuil Station, Cambridge, Belmont), Weston, Concord, Clinton, South Lancaster, Pittsfield and Williamstown. They have been found in Worcester and Springfield. I am inclined to believe they will be found breeding in all parts of our State, if diligently looked for.

A. maculipennis, according to my observations, is a less common species. It is distinguished from Culex with greater difficulty, owing to very slight spotting of the wings. In its position also it differs less from Culex than does *A. punctipennis*, and I have been deceived several times at a distance in confounding it with Culex. I have already referred to the difficulty in distinguishing it from *A. punctipennis* in the larval stage. This species has been collected from Greater Boston. It was found very abundant, in the fall of 1901, near the Charles River in West Roxbury (Parental School). Among specimens sent me from Concord by Dr. Chamberlin, some years ago, this

species was included. Only very few of the insects I have bred in the laboratory were *A. maculipennis*. This may be due to their relative scarcity or to the difficulty of rearing them artificially, as some larvæ usually die. It is of interest to note that in certain localities certain species or groups of species seem to predominate. In the fall of the year when mosquitoes are driven indoors by the cold, in search of places for passing the winter, I have noticed that in one building almost exclusively individuals belonging to the genus Culex would appear. In another building, an eighth of a mile away, individuals of *A. punctipennis* were found almost exclusively. In a third place, three or four miles away, *A. maculipennis* was the predominent species. In a suburb of Harrisburg, Pennsylvania, in August, 1900, Bashore[36] counted 133 *A. maculipennis* and 7 *A. punctipennis*. The conditions favoring the breeding of these species may throw an important light upon the endemicity of malaria in certain places. Thus far they have not been thoroughly studied, and they remain unknown.

It is now generally conceded that all species of Anopheles may become intermediate hosts of the malaria parasites. But some are much more easily infected than others. Of the two prevalent in Massachusetts, *A. maculipennis (A. quadrimaculatus, A. claviger?)* is the one which has been chiefly experimented with in other countries. I am not informed of any experiments with the commoner *A. punctipennis*. Some test of this important matter under conditions and with Anopheles existing in our latitude is very urgent. We should know the relative capacity of the two species for maturing the tertian parasite as drawn from the infected individual. We should know more about the temperature limits within which this development may go on to a successful conclusion. Since such experiments can now be carried on without exposing human beings to infection, by simply dissecting the infected mosquitoes, there is no reason why

this information should not be forthcoming. We are in many respects better situated than those Commissions who have made their investigations in tropical and sub-tropical countries, because we have but one parasite, that of tertian fever, to deal with, while their work has been complicated by the prevalence of three forms.

The application of knowledge gained in tropical countries, while applying in general to our own conditions, may fail in what are biologically speaking minor details, but practically speaking of very great importance. Outwardly and to the entomologist, *A. maculipennis* of our climate and that of Italy or the tropics may be the same.* But there may be important physiological differences due to climatic conditions. Marked differences in susceptibility toward certain diseases may exist in varieties or breeds of higher animals. Similar varietal differences could hardly be detected in mosquitoes by the classifier. Experiments to determine definitely the rôle of our two species of Anopheles in transmitting malaria are called for the more pointedly since voices have been raised recently against the assumption that all Anopheles species act as carriers. Christophers and Stevens found that the very abundant *A. rossii* in and about Calcutta did not convey malaria. When they proceeded in their investigations toward the foothills of the Himalayas, foci of endemic malaria appeared associated with other species of Anopheles shown to carry sporozoites in their salivary glands. Schüffner[9] in studying Anopheles on Sumatra, where malaria prevails chiefly on the coast, came to the conclusion that the coast mosquito soon degenerates in inland regions owing to unfavorable environment.

* The position of the two last segments of the palpi in the male of our *A. maculipennis* is at right angles to the body axis and directed laterally. The figures of the European species, as given by Nuttall and Shipley,[62] Kerschbaumer,[60] Grassi and Celli,[61] have the male palpi nearly straight and nearly in the body axis.

The mosquito, like the higher animals, appears to be the victim, or at least the host of a number of parasites, belonging to widely different genera. In 1901, H. P. Johnson[59] working in my laboratory upon Anopheles caught in the Charles River district, found in about ten per cent. of the individuals of *A. maculipennis* bodies on the stomach wall which simulated very closely the malaria parasite. A very careful study, however, led to the decision that it was some other sporozoon, probably a gregarine.

The breeding places of Anopheles in our State are, as a rule, small, more or less stagnant bodies of water. They do not appear to breed in water kept in receptacles such as rain barrels, tin cans, street traps, obstructed house gutters and the like, but only in water collecting on the ground. But once I saw many Anopheles larvæ in rain-water which had collected in a large iron scoop; but even this was in a country district. This choice of natural bodies of water may account for the fact that Anopheles with us is essentially a rural insect so far as its breeding habits go. Occasionally it has been found in slightly brackish water,[37] but it is essentially an inhabitant of fresh water. It is stated that the insects prefer sunny places, but I have seen them in well shaded brooks.

The food of these larvæ consists of minute forms of life floating in the water, and chiefly algæ and protozoa. The larva during feeding turns its head 180° so that its ventral surface is directed upward. The two brushes begin to swing rapidly. Currents are produced and the minute particles suspended in the water are violently thrown toward the mouth of the larvæ. They are thus dependent upon food floating near the surface layer of water. As is well known, ground-water emerging into the light is rich in those salts which greatly favor the rapid growth of algæ, and E. O. Jordan[38] has found during observations made in Maine that such ground-water contains Anopheles larvæ.

The wide prevalence of these larvæ in the country does not indicate any very great fastidiousness on their part, or any easily determined conditions which must prevail if they are to succeed. Among the places where they are found with us I may mention a few.

In low-lying rich meadows, with very little slope, the ditches used for drainage frequently contain Anopheles larvæ. Where foot-bridges cross them collections of rubbish are likely to form quiet pools for them. In larger brooks, Anopheles larvæ are encountered in pools formed by obstructions in the bed, such as tree stumps, soil carried down during freshets and rubbish thrown into them. Especially where roads cross them, the aqueducts are apt to become dilapidated. Fallen stones and pieces of wood form artificial barriers here to favor the mosquitoes.

Not infrequently small shallow pools of rain or ground-water without any outlet are favorable breeding places. These are frequently the result of insufficient or obstructed drainage due to road building and railroad embankments. The railroads are in fact responsible for many breeding places. Not only has the natural drainage been more or less interfered with by the construction of embankments across drainage valleys, but the soil used for such embankments has often been taken in such a manner as to leave ditches filled with stagnant water on one or both sides.

The larger bodies of water, including ponds, lakes and rivers are not as a rule breeding places of mosquitoes. The enemies of the larvæ seem to predominate in such waters or else the food supply is too limited. Occasionally the shallow margins densely overgrown with water plants may favor them, but even here I have as a rule failed to find any larvæ.

The influence of sewage pollution upon the immunity of the larger bodies of water, more particularly the rivers (*i. e.*, the shallow margins, coves and stagnant reaches)

is an important, though as yet unrecognized, question of public sanitation. It has been my personal experience to find larvæ in several badly polluted streams and not in those comparatively free from such pollution. Whether we are dealing here with a general fact or an accidental coincidence, I am still unprepared to say. Yet there is food for reflection and further study in the suggestion. Water polluted to a certain degree may favor the food of mosquitoes and suppress their enemies. Without going into any detail concerning my observations and impressions on this point, I leave it for future investigation.

Abandoned canals have in some States formed the focus of malaria infection, and there can be little doubt that they are admirably suited as mosquito breeders. Another variety of nuisance is created by brick manufacturing. Excavations are made for clay, and these are abandoned to themselves after the available material has been removed. Some years ago, in trying to account for cases of malaria in Southborough, I found in company with Dr. C. P. Jones a series of depressions overgrown with vegetation and partly filled with standing water. Mosquito larvæ were abundant in some, absent in others. We could not account for these depressions until told that they were old clay pits. A few broken bricks found near them afterward confirmed the statement.

The relation of shallow, stagnant pools and of small brooks and ditches to the mosquito varies considerably with the season and the rainfall. A certain abundance of rainfall may produce breeding places on the one hand, while on the other it may destroy such places already in existence by flooding and washing them out. To take a simple illustration: In 1902 a brook which during the greater part of the summer contained a moderate amount of running water did not harbor any mosquito larvæ. Late in August the amount of water in it decreased, and its bed

consisted of a series of pools with only a little running water. In September I found the stream now containing many larvæ of Anopheles flourishing in the disconnected pools. Here the dry weather favored the mosquitoes. In other parts the dry weather had caused the shrinkage and disappearance of stagnant, undrained pools which earlier in the season contained many larvæ.

Severe drought may favor them by a shrinkage and concentration of water in streams which may greatly favor the food supply of mosquitoes along the banks and in quiet shallow coves. It may also disconnect shallow portions along the banks or shores from the main body and thus create breeding grounds where ordinarily none exist.

High temperature is universally favorable to the mosquito, for its larval life is shortened thereby and the food increased. It is also favorable to the rapid maturing of the malaria parasite in the mosquito. Under a certain temperature the parasite does not ripen.

There still remains one other condition of our surface waters which has been frequently considered the cause or at least the favoring condition of malaria. I refer to the impounding of flowing water artificially by dams. Only those who have explored our State more or less can have an adequate conception of the number of dams which have been built along its water-courses, and which have either been abandoned, or which are still in use. To those familiar with the actual condition of things, an occasional examination of the map is a source of much interest. The streams, large and small, show a series of aneurysmal dilatations which might be considered freaks of nature, were it not that they are the work of man, and that originally beautiful streams have been defaced and deformed to yield the power needed to develop the factory industries of New England.

The site of a dam is usually chosen where its construction

will permanently flood the original banks and form a reservoir. The result is a settling basin in which the suspended matter is deposited, slowly filling up the available space. The next step to offset this filling up is to raise the dam and flood more territory, thereby producing a still broader and usually very shallow basin.

The influence of dams upon the incidence of malaria will depend on a number of factors, and each dam must be considered by itself. The main factor is the relation of the dam to mosquitoes. Among the conditions which may favor the breeding of mosquitoes a few deserve special consideration : —

1. The shallowness of the water and the very gradual slope of the banks which are usually densely overgrown with vegetation and which protect the larvæ from natural enemies.

2. The relative pollution of the water which on the one hand may stimulate the multiplication of microscopic algæ and other food for mosquito larvæ, on the other interfere with the higher animal life.

3. The seasonal fluctuation, whereby in late summer, detached pools and larger collections of water are left as mosquito breeders provided the water in them does not dry up within three or four weeks.

The great danger of such reservoirs has usually been ascribed to daily fluctuations of the water level due to draining off during the working hours and refilling at night. The sloping sides of the reservoirs, formed of a deposit of very fine mud and ooze, are exposed to the sun during the day and in some unknown manner malaria germs were supposed to rise from this alternately submerged and exposed mud. In many instances the original construction of the dam or its subsequent elevation to a higher level flooded woodland and the decaying tree-stumps were looked upon as favoring or incubating malaria germs. To-day we in-

terpret the matter quite differently. There is no evidence, experimental or theoretical, which assigns to malaria parasites life outside of man or the mosquito. They spend their whole life as parasites. Hence the exposed mud flats though offensive cannot any longer be regarded as the *causa peccans*, and the decaying vegetation is concerned only in furnishing food to pools of water harboring larvæ. Dams obstructing the normal current of any stream cannot thus be condemned without investigation. The particular local conditions must be taken into consideration and a careful search made for larvæ at different times of the warm season.

The salutary break in the continued breeding of mosquitoes, and hence in the accumulation of infection, by our severe winters, leads me to consider briefly the ways in which the mosquito escapes destruction during the cold season.

The hibernation or wintering over of adult mosquitoes has been known for many years. They seek the shelter of dark, unoccupied rooms and warm cellars, and the protected nooks in out-houses where they hide in a partly paralyzed condition until the warmth of the approaching spring stimulates them to move and leave their hiding-places. It is surprising to note how many mosquitoes live through the winter in this way. Swarms appear quite suddenly on the first warm day. I have been unable to find among these any males.* The hibernating females are as a rule impregnated and very eager when they have left their hiding places to obtain food. Hence their vicious attacks at this time. The relation of these early attacks upon human beings to the production of malaria I shall refer to again later on. The wintering over of larvæ in water under the ice has been observed in different localities. Its occurrence

* I believe that the testimony is quite general that males have not been found hibernating.

in our latitude has not yet been reported, I believe, and I have no observations bearing upon this subject beyond the one that I have almost always failed to find larvæ late in the fall, shortly before the approach of winter.

The adult females which emerge in the early spring to obtain food for maturing the eggs have not been found with sporozoites in the salivary glands or with sporocysts on the stomach walls. The consensus of opinion seems to be that the malarial infection is not carried over in the mosquito, but that the latter is infected by drawing blood from cases having early relapses or a latent infection.

In concluding this chapter on the mosquito I shall merely mention the hypothesis occasionally brought forward that the infection may pass from the female mosquito to the ova and that the young may spread the germs. This complex process is the one which obtains in bovine malaria, and it is the only way in which the parasite can be transmitted; for the female which draws infected blood never passes to another host. No proof has been adduced in favor of this process in the mosquito; yet I think it should not be lost sight of or cast aside too peremptorily in any future work, for epidemiological studies do not contradict it.*

THE HISTORY AND PRESENT STATUS OF MALARIA IN MASSACHUSETTS IN THE LIGHT OF RECENT BIOLOGICAL DISCOVERIES.

Interest in intermittent fever in our own State has been steadily maintained since the Boylston prize essay of Dr. Holmes. The disease has had more than its share of his-

* A large number of works on the mosquito have recently appeared in various languages. For those intending the more thorough study of species the work of L. O. Howard[35] forms a very good introduction. The largest and most recent monograph is that published in three volumes by F. V. Theobald under the auspices of the British Museum of Natural History. In this volume the reader will find references to other similar monographs. The work of Kerschbaumer[60] gives many interesting details concerning the life history of the mosquito.

torians and chroniclers who have industriously labored to set before us accurate records of its dissemination and prevalence and who have attempted to locate the cause or causes.

As stated by Dr. J. F. A. Adams, there were several distinct epidemics of malaria in New England: (1) the earliest of which we have any records occurring among the settlers, especially in the New Haven region; (2) the epidemic of 1793–99 in Western Mass., (3) that of 1828 to 1836 also in Western Mass., and (4) the one beginning roughly in 1870 and continuing sporadically up to the present.

In Hubbard's "General History of New England," ague and fever is referred to as the "seasoning" through which new comers had to go at New Haven in the earliest years of the Colony. In the second epidemic, toward the end of the eighteenth century, the source of the infection in Mass. is, according to Dr. Holmes's correspondents, Western New York. The types of malaria are spoken of as quotidian, tertian and quartan, and a type is described by Dr. Buel as occurring in the Sheffield epidemic in 1795, whose picture does not fit into the clinical frame of simple tertian. It suggests the æstivo-autumnal fever of more southern latitudes. Yet it may after all have been a very severe type of tertian due to the presence of many generations of parasites. Buel calls it a bilious remittent fever. He emphasizes the pain in the head, back and limbs, the length of the hot fit as from six to forty-eight hours. There was no regularity in the reappearance of the paroxysms. "The fever tended to an intermittent form; but it could neither be called quotidian, tertian, quartan, nor any other name used by authors to distinguish the different species of intermittent fevers." Possibly typhoid fever may have complicated the clinical picture. The immediate occasions for the appearance of the disease were then as now assumed to be the construction of dams, the lowering and raising of the water level in them, and the building of canals. I find mosquitoes mentioned once in

Dr. Holmes's essay as being more numerous than usual durthe epidemic of intermittent and dysentery in the town of Sheffield in 1796.

Concerning the epidemic in 1828 to 1836, Dr. Oliver Peck of Sheffield writes among other things to Dr. Holmes that "the people here generally have a prejudice against the arrest of the disorder, imagining that they must have about a certain number of paroxysms at any rate, and that they are left more healthy if the disease is permitted to go on undisturbed, though bark was formerly, and quinine is at present frequently used, and as I think with benefit. The disorder affects new comers more especially, and more certainly the nearer they reside to the locality." In this letter we have a cropping out of the doctrine of immunity in malaria, already noted in the experience of the earliest settlers who referred to it as the seasoning process. Dr. Holmes's correspondent was as eager then as now to impress upon him that the cases in his town were introduced and not indigenous. Relapses were clearly recognized, and some stated what is not an infrequent occurrence now-a-days, that the recovered patient had a relapse early the following spring. Moreover, the influence of various bodily conditions due to intemperance, exposure and the like in bringing on a paroxysm was emphasized repeatedly.

The reappearance of malaria in more or less epidemic form since 1870 was carefully studied by Dr. J. F. A. Adams. He states that the summers of 1870, 1876 and 1880 were hot and dry, and all streams and ponds became extremely low. These seasons were characterized by an unusual prevalence and rapid spread of intermittent fever; in 1870 in New Haven and vicinity; in 1876 at Hartford and other towns on the Connecticut River in Conn., and in 1880 on the Connecticut River in Mass. and certain localities in Berkshire. The low water of 1880 was extraordinary. The Conn. River had not been so low for many years, and

all artificial reservoirs became drawn down so as to expose an immense area of marshy bottom. The irregular progress of the epidemic is also commented on. It jumped over certain places at first to attack them later on.*

Intermittent fever around New Haven was described by Dr. H. Bronson[40] in 1872. The first case he traces to a saw mill in West Haven in 1863. The epidemic in South Framingham in 1885 has been investigated by Dr. Z. B. Adams[41] and described in a graphic manner. It seems to have been associated more or less directly with the building of a new conduit through Farm Pond.

Dr. C. H. Cook[42] in 1890 published an exhaustive enquiry into the prevalence of intermittent fever in Mass. From one hundred and fifty-two cities and towns responding to his circular letter, eighty-six reported intermittent fever, "an increase of thirty-nine over the number reported in 1880 by Dr. Adams." Thirty-four towns reported sporadic cases only. In fifty-two, the disease was more or less epidemic. In 1894, Dr. J. J. Thomas[43] collated information obtained from physicians and hospital records in towns along the Charles River which showed a very great prevalence of malaria, especially in the town of Newton. The largest number of cases occurred in 1891–4, although in the years 1890 and 1891 the cases had been numerous. There are still two other papers dealing with the same theme whose authors made careful local enquiries. In 1901, Dr. F. L. Morse[45] investigated the prevalence of intermittent fever, past and present, in the towns bordering the Sudbury and Concord Rivers. The earliest case of which he could obtain any definite information occurred in 1880 and is said to have been acquired in Boston. Among 1186 persons, 209 cases occurred during the past twenty years.

* A somewhat similar survey of this last wave of malaria was published by Dr. C. V. Chapin. (The origin and progress of the malarial fever now prevalent in New England. Fiske Fund Prize Dissertation. No. 32. 1884.)

A similar enquiry was made by Dr. Chamberlin[45] for Concord, for the period from 1870 to 1900.*

In addition to these various more or less exhaustive reports we have certain data collected by the State Board of Health in the routine examination of blood films for the malaria parasite. These data are valuable since they are based on the demonstration of the parasite in the red blood corpuscles.

In 1895 the Board began the distribution of coverslips in small metal capsules upon which blood films from suspected cases were to be spread, dried and mailed to the laboratory. There the films were stained and carefully scrutinized for the malaria parasite. Since the establishment of this service many cities of the Commonwealth have created their own diagnostic laboratories, and material from the cities rarely finds its way to the laboratory of the Board. Many physicians do not consider it worth the trouble to send in blood films where the fever is clearly intermittent and is cut short with quinine. In spite of the incompleteness of our records concerning the prevalence of malaria they are quite suggestive. Since April, 1896, malaria parasites have been demonstrated in specimens from twenty-eight different towns. Some of these towns have sent specimens for three consecutive years. Very few appear but once on the list. In all, 175 individual cases were found infected. What proportion of the whole these represent I am unable to state approximately; but I am inclined to believe, from conversations with many physicians practicing in the country, that they represent only a small fraction of the actual total.

Under the most favorable circumstances the study of the distribution and epidemiology of malaria remains difficult for two reasons. The most inveterate malaria carriers know

* See also: Malaria in Boston and Vicinity, by C. W. Townsend. Boston Med. and Surg. Journal, 1892, cxxvii. p. 615, and Intermittent Fever in Brookline, by H. L. Chase. *Ibid*, p. 565.

how to treat themselves with quinine, and thus the very cases which might explain the incidence of intermittent fever escape the enquirer. In the second place the very people who in other matters pertaining to the public welfare may be depended on for aid are often averse to giving information concerning malaria in their neighborhood. Dr. Bronson stated in 1871 that "as a rule men having residences or building lots for sale are, on the ague question, not above deception."

In attempting to interpret the appearance of these waves of intermittent fever we must distinguish between the original sources of the infection and the local favoring conditions. The malaria parasite is not created anew by telluric and meteorological conditions, but it comes from some preexisting parasite. Where did it come from? In the tropics malaria is potentially present at all times. With us it appears as a rule quite unexpectedly and may again disappear. The belief was quite general that upturning of the soil was responsible in some way for the disease. That it closely follows operations involving excavations such as railroad building, grading, tunnelling, and the building of dams, dikes, bridges and reservoirs is well known. The immediate popular inference was the crude, unbiological notion that the germs of malaria live in the soil. While studying the appearance of malaria along the line of construction of the Metropolitan Water System in 1897 and the epidemic in Billerica and Concord several years later, I became firmly impressed with the belief that malarial infection is imported by workmen. This theory* was suggested by experimental studies in bovine malaria which showed that all cattle from endemic regions carry the germs in their blood and that the disease can readily be produced by inoculating a little blood from these healthy, immune animals from infected districts. That workmen from malarial countries may carry the para-

* Was tentatively published by me in 1901 (see lit. 47 and 63).

site in the same way perhaps indefinitely was the only theory that could satisfactorily explain the observed facts. Since that time the theory that human beings are the sources of malarial infection has become firmly intrenched. Koch[46] in his Italian investigations stated that the infected human beings must be considered the starting-point of every season's new cases. Christophers and Stevens reporting to the Royal Society from their field of investigation on the West coast of Africa go so far as to strongly argue segregation of Europeans from the natives, as the latter are largely carriers of the parasites.* The same authors point to the analogy between malaria and Nagana or the Tsè tsè disease. A fly transmits the blood parasite of this disease from apparently healthy wild game and from buffaloes to the domestic animals imported from Europe. The latter usually contract a fatal disease. While admitting the analogy I must confess that that between human and bovine malaria is much closer. The tsè tsè parasite is a flagellate and lives free in the blood. The parasites of the two forms of malaria are sporozoa, both live in the red corpuscles and have many characters in common. Christophers and Stevens, furthermore, ridicule the idea that malaria can be acquired in regions free from human beings and they show that there are very few places even in the heart of Africa where the explorers are not near natives.

When the theory that the laborers and not the upturned soil were responsible for malaria was first formulated in my mind I felt that in so important a matter there should be ample proof. New theories or hypotheses unsupported by facts are more dangerous than none at all when promulgated,

* "These facts are of importance as they show that the generally received idea that Europeans derive malaria from preexisting cases in Europeans requires considerable modification. This factor, it seems to us, sinks into complete insignificance beside that of infection derived from native sources." (Rep. to Malaria Committee. Royal Society, Seventh series.)

since many are contrary to fact and if applied are certain to cause damage. It seems to me that taking into consideration the abundant contributory and demonstrative evidence which has been accumulating since 1897 we are quite safe, in our efforts to suppress malaria, in now taking this theory as a fact and acting upon it.

If then we focus our attention upon man as the carrier of malarial infection, and if at the same time we consider that the more "seasoning" a man has had up to a certain point the more ready he may be to have gametes in his blood after infection from a less seasoned neighbor or bed-fellow, we shall be able to explain many of the peculiar freaks played by malaria in our State.

The experience of the early New Haven settlers in going through a "seasoning" process is the same as that experienced by the early settlers of the middle west. Malaria was quite prevalent during pioneer days, but it slowly declined and in many places disappeared. This decline and disappearance were usually ascribed to the drainage and cultivation of the soil. This was, to be sure, an important factor in suppressing local breeding grounds of mosquitoes, but these did not originate the germs. The latter were, in part, brought by pioneers from endemic regions in the south and transmitted to the susceptible population from the north. A third factor, which in many places and probably also in the Connecticut colonies may have been the predominant one, was the Indian. The aborigines, when exposed to malaria, must have gone through the process of immunization just as to-day the native Africans are going through this process from infancy on. Even if we assume that the adult was wholly immune and free from infection, there must have been all grades of immunity in accordance with age and frequence of exposure in any given locality. With the gradual thinning out of the natives or their forced migration

and the introduction of Peruvian bark, the malaria parasite was gradually destroyed.*

Of the outbreak in western Massachusetts, at the end of the eighteenth century, the sources of infection can be discovered only by a careful study of contemporary local history with special reference to the movement of the population and the modes of life. Even without any appreciable influx of immigrants from malarial countries, our own southern states could have furnished at any time a sufficient quota of malaria carriers to start an epidemic under favorable local conditions. Dr. Bronson, in his quest for the origin of malaria around New Haven, found what he took to be the first case in 1863 on Cove river in West Haven in a sawmill. "While thus occupied (repairing in the pit and about the flume of the mill) in August, 1863, in a season of drought, he [the patient] was seized with a fit of ague. *He had been at the south several years before and knew the disease but had not had it.*† According to his statement, his was the first case in that quarter and the only one that year."

The last invasion of New England by intermittent fever, beginning roughly with 1870 and extending to the present, a period which has been so well described in its various manifestations by others already referred to, was largely due to the great material development, which found expression in many new public and private enterprises, such as the reconstruction of railroad beds and highways, the introduction of public water supply and sewerage plants, the building of mills, and the draining, filling and grading of suburban territory and the like. In connection with these enterprises, the source of malarial infection during the last thirty years I regard as coming from the Italian, Hunga-

* It is of interest to note here that the year of the introduction of Peruvian bark by the Countess of Chinchon, 1638, witnessed the planting of the New Haven colony. Quinine, the active principle, was not used until 1820.

† The italics are mine.

rian and other immigrants from endemic foci, and the contingent of colored laborers from the southern states.

There is a remarkable coincidence between the growth of this foreign body of immigrants and the progress of malaria in New England in these latter decades. Those who have traced its movements claim that it came from the southwest, that is from the New Jersey coast, and spread northward and eastward. I am inclined to believe that it came from the transatlantic steamers landing their passengers in New York city.

The twelfth census gives these figures of the foreign-born population from Italy in our country since 1860:

1860 . . .	10,518	
1870 . .	17,157	
1880 . . .	44,230	
1890 . .	182,580	Increase 312.8%
1900 . . .	484,027	Increase 165.1%

Of that same population there were males of voting age, in —

1890	70,853 aliens,
1900	133,810 "

the total number of males of voting age in 1900 being 252,534. The predominance of men is seen by comparing this figure with the total Italian population given above.* Of this large contingent Mr. Prescott F. Hall[48] states that 95 per cent. are destined for New England, New York, New Jersey and Pennsylvania. What proportion of such immigrants come from malarial districts of Italy it would be impossible to determine with any accuracy. The Commissioner of the Bureau of Labor Statistics of Connecticut

* The annual immigration from Italy was 12,354 in 1880. Fluctuating more or less during the decade, it reached 52,003 in 1890. During the following years it was usually above this figure. In 1900 the total was 101,662, of which 84,346 are reported as from southern Italy. In 1902 the total reached is the enormous sum of 180,535, of which 152,915 are from southern Italy. (From figures kindly furnished by Mr. Prescott F. Hall, Secretary of the Immigration Restriction League.)

is quoted by R. Mayo-Smith[49] as stating that "the Italian immigrants come almost entirely from the southern districts of Italy." In 1897 I interrogated twelve Italians living in a laborers' camp in Southborough. Five claimed to have come from Naples, three from Rome, and only one from Piedmont. Three did not give the district.

Concerning the importation and use of Italian laborers, I quote from Prof. R. Mayo-Smith, the following statement:

"There has been a large number of such cases (laborers imported under contract) during the last ten years (1880–1890). Many of the Italians who have worked on our railroads have been brought by contractors for that purpose. The New York commissioners of labor, in 1885, found a contractor in Buffalo who admitted that he had furnished four hundred foreigners to railroad companies and other corporations during the preceding year. We hear of similar cases in New Jersey, Kansas, Iowa and Wisconsin. The commissioner of the labor bureau in the last named State asserts that in the year 1886 the State was flooded with circulars from an Italian labor and construction company in New York, offering to let men for 'tunnelling, grading, mining, breaking stones, laying ties, repairing washouts, laying water and gas mains,' etc."

Among the other foreign immigrants from southern Europe who may bring the malaria parasite and who are of sufficient importance, numerically, to be considered here, are those from the basin of the Danube and its tributary, the Theiss in Hungary. The twelfth census furnishes us with the following figures of the foreign-born Hungarians:

1870	3,737
1880	11,526
1890	62,435
1900	145,714

Of voting age, there were in —

1890	38,749
1900	72,897

Assuming that these figures are fairly accurate, there were in the United States, in 1900, over three times as many foreign-born Italians as Hungarians.*

Malaria may also be disseminated by chronically infected inhabitants of malarial districts in the south when conditions are favorable, as in camps of negro laborers. A number of cases occurred in 1897 in such a camp near West Berlin, Mass.

The thousands of immigrants from malarial regions are under ordinary circumstances absorbed without causing any appreciable increase in malaria. Those that go into the crowded quarters of our large cities are not exposed to the bites of anopheles, excepting in rare instances. Those that go into the country districts to till the soil are not likely to create a focus of malaria, as the conditions for transmission from isolated cases are not very favorable in our climate. Under ordinary circumstances, therefore, the scattering of such potentially dangerous people over a wide territory would perhaps arouse no attention or apprehension.

There are many examples of imported malaria, known to physicians of our latitude, before whose door the spread of malaria cannot be laid. The returning soldiers of the Civil and the Spanish wars did not, so far as observations go, infect their neighborhood. Sergent[50], after studying the subject in Paris and its suburbs, states that although there are many anopheles in the suburbs, and some chronic cases of malaria in the city from the colonies, no indigenous cases came to the notice of the author.

When, however, a considerable number of individuals remain together, work in rural districts in proximity to breeding places of mosquitoes and sleep at night in sheds

* In 1880 the number of immigrants from Hungary was 4,363; in 1890, 22,062. In 1902 the total Magyar immigration was 23,610. In the intervening years there was the usual fluctuation, corresponding with periods of industrial depression and prosperity.

built in the open country, usually near some small body of water and wholly unprotected from the attack of the omnipresent species of anopheles, the situation is wholly different. Under such conditions, usually, some one or more individuals carry malaria parasites. These are transmitted to the non-immune or only partially immune fellow-laborers. Opportunity for the infection of mosquitoes with gametes from the blood is ample; and, sooner or later, the infected mosquitoes find their way to the very susceptible natives of the territory where the work is going on.

We are, all of us, tolerably familiar with the condition I have described. It is a method employed many years ago in pushing railroad construction forward in more or less unoccupied territory where it was necessary to retain the force of men near the scene of operations. This method of carrying on work in more or less densely populated districts has been in use certainly since 1870. Dr. Bronson furnishes the following illustration for the New Haven district, which I quote verbally:

"In pursuance of this agreement they drew down the water, and when the ground was sufficiently dry, in August, 1871, set about forty men to work cutting the bushes at Pine swamp, and in a tract of about twenty acres at the head of the lake. The men were occupied some four weeks cutting and burning, during which time about half the party slept on the ground near their work. Of the whole number, only one had the fever before the job was completed, but I have heard of two or three others who had it afterward."

Dr. J. F. A. Adams quotes the following letter received from Dr. C. Seymour of Northampton, Sept. 27, 1880:

"A very large percentage of the cases have occurred at a railroad station on the Connecticut river, two miles below our village. Here is located a large sawmill, employing seventy-five men; and these have quite generally suffered. Many of them have never consulted a physician, as they know quinine cures the 'shakes,' and get and use it accordingly."

Dr. Z. B. Adams says that in 1885 "an Italian, a laborer upon the new conduit through Farm Pond, was sent away together with several companions suffering from the fever."

I have the microscopic records of malarial infection from several laborers' camps. Such cases were usually overlooked some years ago. If discovered they were supposed to be a product of the environment, the upturned soil, the swamp or the partly drained pond or stream about which they were at work. Many patients treated themselves. The presence of malaria was recognized only when the infection had become disseminated and had attacked the inhabitants living near by.

Occasionally the accumulation of infection goes on so rapidly that veritable epidemics are the result. The disease appears in an explosive manner like typhoid fever or cholera. A good illustration of this type of outbreak occurred in Rhode Island in 1880[51].

On August 18 a workman in the yards of the Nayatt Brick Company was taken with chills and fever. Five days later sixty workmen were affected, some with very severe symptoms. On August 25 the disease reached its climax with seventy on the sick list. About Sept. 1 there was a general lessening. On Sept. 20 nearly fifty were again on the sick list. During the season one hundred and eighty-five persons, comprising almost the entire force, had been affected. Of the workmen attacked nearly all were Canadians. They slept in two lodges near the works. The two upper stories were occupied as sleeping rooms, the highest being twenty feet from the ground. Both floors were equally affected. The epidemic came very unexpectedly for cases of malaria in this vicinity could not be recalled by the oldest inhabitant.*

Another epidemic of a different character as regards time

* Similar epidemics were noticed by Dr. E. H. Stevens[52] in the Cambridge brickyards among French Canadians in 1892 and previously.

and topography is the celebrated New Lenox case described by Dr. J. F. A. Adams[39b].

In 1870 the dam of the Smith Paper Company on the Housatonic river was raised three feet above the already existing four feet. In the lower half of the district influenced by this dam, which caused a setback of four miles in a direct line, water spread out irregularly to an average width of a quarter of a mile. With the daily variations in the depth of the water portions of the muddy bottom were alternately covered with water and exposed to sun and air. During the very low water in the summer and fall of 1880 coves and detached pockets of water were formed.

In the summer of 1878 intermittent fever began to prevail in the vicinity of this reservoir. The first cases appeared close to the river on the east side at the foot of the mountains bordering the reservoir.

Of a population of eight hundred souls about three hundred and fifty-three were attacked up to October 1, 1882. Up to 1880 cases had appeared in every one of the twenty houses on the east side of the river between the dam and the Pittsfield line. In some houses as many as six cases occurred. The surrounding towns were comparatively free from malaria during these years.

The celebrated lawsuit which followed failed to place the cause of the epidemic upon the company who raised the dam. Looking at the case from the present standpoint we should say that some germ carriers, possibly foreigners, as workmen, wandering gipsies and the like, entered the territory around the reservoir, and the conditions being made very favorable by the drought, the mosquitoes became infected in large numbers. Last autumn I had the good fortune to inspect this interesting region both alone and in company with Dr. Adams. Anopheles larvæ were encountered in the ditches in the meadows, in isolated pools and in the river itself. Those which I reared into adults were all *A. punctipennis*.

I have no doubt that similar severe local epidemics have occurred but they usually fail to find a faithful student and chronicler to put them on record.*

In endeavoring to trace the origin of such localized outbreaks the student of to-day is confronted with the task of searching past records concerning the movement of the population with special reference to the laboring classes. This task, which I have left untouched, would amply repay many a student in searching for subjects for a thesis and it would utilize the experiments which human beings, quite unaware, have been and are still making upon themselves and upon one another, experiments which are of the highest value as they are inflicted upon us in the natural way.

In the position taken that laborers from malarial countries may introduce intermittent fever, I find myself no longer alone, for similar inferences have been made by European observers recently.

The mouths of the Elbe and the Weser river in Germany have been in times past the scene of much work in the construction of wharves, dikes and reclaiming of wet land. Malaria has usually accompanied this work. Martini[53] has recently published an account of several outbreaks which are of special interest to us. A number of Dutch laborers were imported in April, 1901, to work upon a large dike near Wilhelmshafen. Soon after their arrival some were affected with malaria (relapses?). From the scene of their work malaria spread and prevailed in 1901 and 1902.

On the West Frisian coast, similar work was carried on by natives from 1888 to 1900 without the appearance of malaria. In 1899 to 1901, the work was done by Dutch laborers of the company furnishing the party above referred to and malaria appeared. These laborers came from a region in which malaria is endemic. Near the mouth of the

* An epidemic in Deerfield in 1886-1888 is briefly described by Dr. S. W. Abbott in the report of the State Board of Health for 1888.

Ems river malaria appeared during the construction of harbors and a lock on which one hundred Italian workmen were engaged. This subject is considered of so much importance that the government has established a special laboratory at Wilhelmshafen where construction work is being carried on to prevent the outbreak of malaria among the workmen and the inhabitants. Anopheles is abundant in the localities referred to.

Among the outbreaks of malaria which are of more than usual interest are such as occur among the inmates of schools, prisons and institutions of one kind and another. Persons are now and then attacked who have been confined as prisoners.

The few instances which have come under my immediate observation were always near breeding places of Anopheles, and some of the inmates, gathered together from various localities, were evidently old cases of malarial infection or else from places where malaria is endemic. In several cases such persons would reveal their chronic infection by passing through an attack after they had left their home in the endemic territory and settled down in their new abode.

Martini [54] has recently given a very plausible explanation of the early and repeated occurrence of malaria in certain houses. The curves of malaria in the endemic region of North Germany show two maxima; one in April–May, the other in August–September. Last year Martini came to the conclusion, after a study of the local conditions, that the early cases are due to hibernating mosquitoes which are called from their hiding places by the great warmth of the dwellings. They feed upon the blood of persons who have passed through attacks the previous season and find sufficient warmth in the houses to mature and transmit the parasites to other persons in the same dwelling.

There are certain warm days in March and April when

mosquitoes leave their hiding places and sting vigorously whenever the opportunity offers. This year March 14 was one of these enticing days, and I was able to capture a considerable number of females. In a school not far from Boston, situated in a locality favorable to *A. maculipennis*, the first case appeared on April 8. The infection was probably carried by mosquitoes which swarmed March 14, and which infected themselves on that day or later from some latent case dating back to a former season. We should expect to encounter cases about three weeks after such early warm days which allows for the ripening of the sporozoites and the period of incubation of the new case.

It might be supposed that malaria, once established in a house, can pass from one member of a family to another and that cases may be looked for every three weeks during the mosquito season. If this were true, the contagious character would have been recognized long ago. In the foregoing pages, I have endeavored to show why this would not be likely to occur. The patients attacked are treated promptly and gametes cannot form. It may also occur that unusually susceptible persons even, if not treated, do not form gametes for a time. Occasionally, however, the successive illness of members of the same family is noticed. Thus, Dr. Bronson, in the report from which I have already quoted, made the following statement in 1871:

> "The frequency with which the several members of a family, in a previously healthy neighborhood, have sickened one after another when once the complaint was introduced, often suggested to Dr. Barker the old idea of contagion. It must be admitted that authority is opposed to this idea, but I do not think the question yet settled."

In looking over some records which I collected with considerable care about six years ago, in a town then recently infected with malaria as a result of extensive public improvements, I find that house epidemics did not figure to any ex-

tent. In one family, consisting of two adults and five children, the father was taken with quotidian chills, and a child three years old who slept with him was attacked with tertian fever three weeks later. Here there is some evidence of transmission, but it may have been an accidental coincidence.

In a family of six the father was attacked in May, but no other members subsequently. In a family of nine, consisting of the parents and seven children, the father and a child two and one-half years old were attacked in July, within a few days of each other. No other cases occurred later.

In a family of four, only the mother was attacked in July. In a family of five, only the father was attacked in August. In a family of eleven, mostly grown up, two daughters were attacked within a few days of each other, in August. About a month later one other member was taken ill.

A number of other illustrations might be given which would bring out substantially the same fact; large families of whom but one or two, rarely three, are attacked, and usually simultaneously. The houses do not become foci of the disease.

The facts which have been cited to show that houses do not necessarily retain malarial infection, probably because the blood of the diseased members does not produce fully ripe gametes, naturally leads to that very important phase of our subject which relates to the spontaneous disappearance of malaria.

A fact which stands out prominently in the eminently interesting chronicle of New England's ague spots, is the disappearance of this malady after it had prevailed for a time. Tradition represents it very prevalent in the earliest colonial days, but the practitioners of the early quarter of the nineteeth century did not see much of it.

The testimony from various parts of the temperate zone seems to be the same, that places once malarial are now entirely free. Certain portions of England, France, North Germany, and the Netherlands, have passed through periods of malarial endemicity. In such places Anopheles are still present, but the virus has disappeared. Farther south the process may have been the reverse of this. The territory about the mouth of the Tiber, now thoroughly infected, used to be a summer resort for the Romans. The Roman Campagna shows signs of former active cultivation and occupation. In our own State, the epidemics associated with public works have, as a rule, promptly subsided after the work was completed, and in some instances almost completely disappeared.

This transient visitation of intermittent fever may be ascribed, in our climate at least, to several causes, chief among which is the prompt treatment of the disease, and the consequent incapacity of the patient to infect mosquitoes. The general conditions are also quite unfavorable. Among these are the thin population in the rural districts, the scattered homes, the general scarcity of mosquitoes of the genus Anopheles, the occasional cold summers and the seasonal interruption of the propagation of mosquitoes by winter. Where one or more of these conditions unfavorable to transmission are suppressed, as in years of drought, in a dense rural population near stagnant water, or among an illiterate, ignorant class of people among whom cases go untreated, endemicity may reasonably be expected. The longer it is allowed to proceed unchecked, the more difficult its final eradication.

The disappearance of malarial infection from large territories in European countries is probably due to the decrease of wars of invasion, and hence of camp life of soldiers in infected regions, and of infected soldiers from malarial regions in territory hitherto free from infection. The lack

of any systematic use of quinine greatly aided the disease under these conditions.

The spontaneous disappearance of malaria is an indication that it was forcibly and overwhelmingly imported at one time, and that it cannot re-establish itself except under certain new industrial conditions, simulating camp life in many respects, such as the laborers' camps, rural schools, prisons, hospitals and factories.

In the foregoing brief review of the incidence of malaria in our State, I have purposely avoided going into detail concerning local epidemics which I have examined more or less in detail. The reader may readily consult for himself the published documents referred to at the end of this paper, in which the essential data have been brought together.

Though much has been written upon this subject, the student finds great difficulty in utilizing past evidence because there is, as a rule, complete silence concerning the, to us, most important factor, the human carriers of the infection. It is for this reason that I have been induced to step slightly beyond the bounds of the severely critical treatment of evidence in this lecture. My object has been to stimulate physicians throughout our State to collect facts from the new standpoint, for only in this way can the views maintained in this paper be rigorously tested. All biological research of medical problems must finally meet its fate for good or ill by being confronted with the human patient, and this confrontation rests entirely in the hands of the physician.

PROPHYLAXIS.

It would be unfortunate if, after the tendency of our city population to spread into the country had been fully established, malaria should come to fasten itself upon such population and drive it back into the heart of the cities.

There is at present no immediate prospect of such a calamity, yet the increase of rural population in density without adequate improvement in environment might lead gradually to endemicity of malaria.

The number of people in our State, living in an essentially rural environment, is larger than is generally supposed. The twelfth census gives the total population of the State as 2,805,346. In eleven cities, having each a population of over 40,000, the total number of inhabitants is approximately 1,228,000. Of this number, many live in the outskirts in what is practically rural environment. This class may be allowed to offset those living in the heart of the smaller cities, not included in our estimate, leaving about one and one half million inhabitants as country residents. Of the other half, the larger number visit the country more or less and are, to a certain degree, exposed to prevailing malarial influences.

The means to be resorted to, in preventing and suppressing malaria, will, without doubt, occur to those who have read the foregoing pages, and any special suggestions may seem superfluous. Yet, in view of the danger which is always likely to beset the awakening public sense and responsibility of going from one extreme to the other, from ignorance and apathy to a too vigorous, wasteful and often injurious campaign, it seems best briefly to summarize the conditions to be met and the simplest means of attaining the desired end. The two things plainly to be done are to suppress Anopheles as far as possible and to shield the malaria patient so that Anopheles cannot become infected.

In localities where malaria is not known to exist, but where there are breeding places of Anopheles, the destruction of such breeding grounds is not essential from a public health standpoint. If, however, in such or similar localities, public works are to be undertaken, the situation is entirely changed. Great care must be taken to prevent

the introduction of malaria. There should be, at the outset and before any digging or other open air work is undertaken, a thorough biological survey by a competent person of the entire locality which may come under the aerial influence of such work. Breeding places of mosquitoes should be carefully noted and plotted on a suitable map. For this purpose the inspection should be made in the spring, the summer and the fall, as the conditions are likely to be quite different in different seasons. Allowance should be made for drought and the conversion into breeding places of bodies of water free from mosquito larvæ during seasons of ordinary rainfall.

The effect of the work to be undertaken upon drainage, either temporarily or permanently, should be carefully considered. Especially the building of embankments and roadways should be allowed only when their probable effect upon surface water is not favorable to stagnation. Excavations for brickyards, for material for roadways, trolleys, etc., should be forbidden if the ground water level will be exposed thereby and a stagnant pool created. The sins of railroad building, committed in the past, are numerous and practically irremediable. No new ones should be permitted. One of the richest breeding grounds of Anopheles about Boston with which I am acquainted is a triangular piece of marsh completely shut in by railroad embankments and converted into a fresh water pool. [55]

The treatment of existing breeding places, before and during the progress of work by gangs of laborers, may be palliative or radical. The palliative method, now so well known, consists in covering the surface of stagnant, mosquito-breeding bodies of water with some grade of petroleum oil. The oil which is scattered over the surface by pouring, by spreading with a broom dipped into the oil, or by the use of pump and hose with sprinkler, etc., forms a thin film which interferes with the respiration of the larvæ and

kills them. The film disappears by evaporation and must be renewed every two or three weeks, according to conditions.* The amount of light fuel oil required is approximately one ounce to fifteen square feet, according to Howard. According to Kerschbaumer (60, p.119) one square meter requires somewhat more than 0.5 liter of petroleum to completely cover the surface. This would be approximately 21 ounces to 15 square feet. Why he uses so much I am unable to explain. Palliatives in the shape of petroleum or its combinations should not be used upon water unless the larvæ of mosquitoes have actually been found in it. The interference with the normal aquatic life may lead to as yet unrecognized, undesirable results.

A vigorous campaign against all mosquitoes was waged during 1901 and 1902, in the town of Brookline under the local board of health, by Dr. H. L. Chase and described by him recently. This work, done in our midst and adapted to conditions prevailing in our State, may well serve as a model and guide for other towns where a destruction of all mosquitoes is desired.

Wherever the breeding can be suppressed by natural methods as contrasted with the artificial one of poisoning or asphyxiating the larvæ it should be done. In level meadows the open ditches, if more or less continuously filled with water, should be replaced by some form of covered drains. Shallow pools in which fishes cannot subsist should be filled up. Brooks should be kept free from debris washed down or thrown into them. Such debris provides quiet pools where larvæ are usually found if not elsewhere. The larger streams and rivers usually are free but the banks should be searched for detached pools. In the case of very small rivulets, ditches or brooks, some

* Recently a proprietary substance known as Phinotas oil has come into use. It is said to represent some combination of petroleum. It sinks to the bottom when applied and subsequently rises again. It is said to kill all life in waters treated with it.

flushing device may be useful. The water may be dammed for a certain length of time and then discharged all at once. The larvæ will be swept into larger bodies of water and there destroyed.*

It is of interest to observe the want of topographical knowledge of suspicious bodies of water on the part of intelligent inhabitants. We may truly speak of the unexplored wilderness of the average town brook. The land is cultivated to within a certain number of yards of such a brook or stream and an impenetrable tangle of vegetation guards it from intrusion on both sides. Its presence even may be unknown to many who have frequently glanced at the line of bushes and stunted trees under which it is concealed. It has been claimed that mosquitoes will not breed in water thoroughly shaded by trees, shrubs and other vegetation. This may be true to a certain extent, but larvæ are certainly found in shaded pools. In any event, our brooks should be made accessible to inspection even though the vegetation on the banks be largely preserved. Even the greatest care in maintaining the bed of a brook free from obstructions may not avail in times of drought. Pools will form and larvæ will appear in them. Occasional petrolizing or flushing may then be necessary if malaria prevails.

Swamps are usually regarded as fertile sources of mosquitoes, and if actual inspection should prove that the suspicion is true, petrolizing, permanent flooding, or drainage are the only remedies. Not all swampy ground favors mosquitoes however. I have repeatedly been surprised in failing to find a single specimen in them.

The expansion of our systems of parks and reservations and the increasing patronage which these open air spaces are receiving from the public housed in the heart of our

* I found after writing this that Kerschbaumer has also recommended this device of periodic flushing, especially in dry seasons. (60, p. 130.)

cities make it more and more necessary to inspect for mosquito larvæ the bodies of water usually artificial which are scattered over these reservations. Neglect of this precaution might easily convert our parks into centres for distributing malaria to a population otherwise sheltered from it in the confines of the city. Squads of laborers are frequently employed in the reservations and may infect the mosquitoes. I recall one case in a child living near a large park, whose infection could hardly have come from any other source.

Since excavation and other out-of-door work may be undertaken at almost any time in the suburbs of cities, the campaign against the mosquito in such territory should not be allowed to flag, but should be pushed vigorously until all breeding places have been destroyed or at least controlled by sanitary authorities.

The frequent appearance of malaria in the heart of cities at present is in many instances traceable to extensive excavations near by, but considering the summer exodus from our large cities which includes almost every one now-a-days, if only for a half holiday, the sources of urban malaria may be many, and impossible to locate.

In rural communities rain-barrels and open catch basins, which are usually inhabited by Culex larvæ, should also be searched to note any Anopheles larvæ which may have acclimated themselves. Privy vaults have been found to be good breeding places for Culex in regions farther south.

Fortunately for us, salt marshes though very prolific in mosquitoes of the genus Culex do not form breeding places for Anopheles. The immunity from malaria of our sea coast and the banks of estuaries under tidal influence has long been known, and it forms an agreeable confirmation of scientific studies which eliminate Culex as transmitters of malaria.[55] The late Dr. Greenleaf,[58] who had given much attention to intermittent fever about Boston, showed that the estuary of the Charles river as far as Watertown

could not be regarded as a factor in malaria as there were no cases along the riverbank. He also found the park police along the estuary free from malaria.

The extermination of the hosts of mosquitoes, bred in such marshes, does not come within the scope of this paper. It may, however, be said that if attempts made to drain such mashes of the salt water are successful, care must be taken to exclude fresh water from low places in them otherwise Anopheles may move in where Culex was driven out.

During the progress of open air work requiring the employment of large bodies of men who must live in camps, there should be in addition to a thorough control of the breeding places of mosquitoes an equally thorough sanitary supervision of the laborers.

Since much of the infection of mosquitoes and human beings goes on after dark, the camps should not be placed near the centre of population nor near small bodies of water unless the latter can be kept free from larvæ. The laborers should be inspected from time to time, and any suffering from malaria removed to some hospital or other place where they can be adequately protected from mosquitoes. Notification of the disease among the inhabitants should be insisted on at such times and the sale of quinine by druggists reported to the local health authorities. Where the Anopheles mosquitoes cannot be satisfactorily controlled, the laborers' camps should be well screened and the latter forbidden to move about after dark. Whenever the mosquitoes are properly taken care of the personal freedom of the laborers need not be interfered with to this extent.

It would be of interest to study carefully the health of any town where large public works are being carried on with foreign labor but where the workmen scatter after dark to different houses; also where native labor is being employed exclusively.

Where malaria has been prevalent for some years and where it has assumed an endemic character by cropping out under various conditions in the inhabitants, as a result of latent infection the difficulty of completely eradicating the infection is great because the number of carriers of the parasite is large and mosquitoes may infect themselves readily. Under such circumstances, it will generally be found that the water courses, swamps and ponds have been sadly neglected by an indifferent, indolent public. Streams are used as depositories for all kinds of refuse and the conduits are out of repair. Sometimes railroads are to blame for cutting off portions of ponds, lakes, etc., and converting them into stagnant swamps. In some places, improvements undertaken years ago have left the territory more favorable for mosquitoes. In one town I saw an abandoned portion of a river bed favorable for breeding mosquitoes which had been left by the artificial straightening of the course of the river. In almost any town signs of some past favor to mosquitoes, ignorantly bestowed, are found by the interested observer.

Vigorous effort to reduce the mosquitoes coupled with popular instruction concerning personal protection against mosquitoes, prompt treatment of individual cases and the necessity for concerted action, should succeed in every case in a climate like our own. Such success may not be realized for several years because the people can only gradually rid themselves of latent infection.

In all efforts to suppress malaria by the destruction of mosquitoes it should be borne in mind that those breeding places nearest the bulk of the population should be attacked first and then, with increased means and assurance of success, the territory under surveillance should be gradually expanded. Breeding places over half a mile from dwellings are regarded by many observers as not likely to be of much consequence, yet they should be dealt with, if possi-

ble, for they serve as a source for the stocking of nearer territory.

The question naturally arises in our minds in reflecting upon this important subject whether, with increasing density of population, malaria will eventually succeed in fastening itself permanently upon the State in spite of efforts made to prevent and suppress it along the lines indicated. Fortunately no capital spent upon the radical extermination of the mosquito will be wasted. Whatever is done in this direction will redound to the general good of the people. The campaign against the mosquito will lead to a general cleaning up and to the cultivation of waste land; it will acquaint us with our own brooks now overgrown and concealed; it will tend to bring our dispersed and shattered streams back into their natural beds by the removal of unnecessary dams; it will prevent the private transportation interests from riding roughshod over the land, gouging out here and there unsightly holes and leaving them to choke up with water plants. Intensive cultivation will do much to repair the damage done by neglect of arable land. We shall be even more careful about permitting the pollution of our streams than heretofore if, as I believe, it tends to favor the mosquito larvæ.

The success of the struggle against an endemicity of malaria is favored by our climate, which is purified annually by frost. Only a comparatively small number of mosquitoes survive and these must re-infect themselves again in the spring. Even under very favorable conditions it takes a whole summer for them to gather enough momentum to produce an epidemic in the late summer and early fall when the frost again sweeps them away.

On the other hand, there are increasing difficulties to contend with as the growth of population continues. The cosmopolitan character of our immigration and the steady stream of people from malarial foci in Europe tend to

keep up the supply of infection in our midst. The tendency of gathering a fairly dense population in mill-towns, often in the midst of extensive breeding grounds of mosquitoes, makes them compare well in opportunies for infection with the migrating and transitory laborers' camp. Fortunately this "urbs in rure" population at present does not come from malarial districts to any extent, and hence they have been comparatively free from malaria with a few marked exceptions.

We must also bear in mind that we have arrayed nature herself against us in this struggle against a malarial climate. The great fluctuation in the volume of water in our streams from season to season, the resulting tendency toward bringing down large quantities of silt during freshets which gradually choke the currents in the low lands and cause the stream to widen as it grows shallower are all processes in favor of the mosquito. The deforestation of the land feeding these streams is largely to blame for these conditions and, as it continues, who may feel certain that our descendants living in the rich river valleys may not assume the sallow hue of malarial cachexia and drag along a miserable existence for which the greed of their forefathers is mainly to blame? It is safe to predict that there will not be enough physical vigor in these descendants of a highly conventionalized nation to successfully imitate the immunizing capacity of the African native. They will give way to more sturdy immigrants or else the land will be abandoned.

In sketching this future possibility, I do not wish to be discouraging, but simply to stimulate our people because we have still in our grasp the chances for ultimate success.

It is to be hoped that as our control over malaria increases the paralyzing sensitiveness of communities upon this matter may give way to a more active coöperation with the investigator who is endeavoring to elucidate the local

causes of the disease and who is powerless, without the assistance of the public and the medical profession, to make an adequate investigation. The hearty coöperation of the members of the medical profession is of special importance since they meet the disease in its only visible manifestation, the paroxysm in the human subject. In nearly every community some one or more physicians may be found who are prepared to assist and give their time, who are personally interested in the scientific problems involved and their practical value, and who are prepared to meet the slow returns of science by adequate outlay of time and strength. To many of these I am indebted for valuable assistance given ungrudgingly. With the continued coöperation and assistance of these disinterested helpers, medical science may be able to solve the many minor problems which still surround this subject, and public health may be in position soon to deal more firmly and radically with local causes.

SUMMARY.

1. There is no evidence that any but the tertian form of malarial fever can be propagated in Massachusetts.

2. The original source of tertian infection must be looked for in the blood of individuals coming from permanently infected localities in our own country and in southern Europe.

3. There is no definite information as to the stage of disease or relative immunity in which mosquitoes may become infected, but analogy with similar diseases of animal life indicate that the gametes are not formed early in the disease, and that relatively immune persons are the most dangerous especially after fresh exposure because in them gametes form very promptly without causing much or any clinical disturbance.

4. The dissemination of infection is most easily promoted in our latitude when people live in a crowded condition, unprotected from mosquitoes and near breeding places of Anopheles.

5. The decline and disappearance of malaria after importation and epidemic prevalence is in part due to relative isolation of the inhabitants and protection by quinine and from mosquitoes, and in part to the absence of persons partially immunized by long exposure in endemic localities.

6. There is some evidence that sewage pollution in surface waters favors mosquito larvæ directly, through increase in food supply, indirectly, by injuring their enemies.

7. Since malaria may be latent and hence unrecognized, and since it is largely a disease of the lower classes whose movements it is difficult to control, the best method of reaching it is to suppress the mosquitoes whenever possible.

8. Malaria is of sufficient importance to become a notifiable disease.

9. Infants and children exposed should have their blood examined during any disturbance of health.

10. In times of epidemic malaria it may become necessary to make special regulations governing infected persons.

11. It is of great importance that the relation of the widely distributed species, *A. punctipennis*, to the parasite of tertian fever be accurately determined.

12. It is also highly desirable to test the infecting power of fresh cases of tertian fever as compared with relapses and with individuals from malarial countries.

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DESCRIPTION OF PLATES.

(The photomicrographs were prepared by Mr. L. S. Brown, at the clinico-pathological laboratory of the Mass. General Hospital, with the kind permission of the director, Dr. J. H. Wright.) The specimens are all from insects caught in this State.

PLATE I. Fig. 1. *Culex stimulans.* Head and appendages of male. Palpi long, with proboscis between them.

Fig. 2. The same species. Head and appendages of female. Note short palpi and compare antennæ with those of male in preceding figure.

PLATE II. Fig. 3. *Anopheles maculipennis.* Head and appendages of male. The proboscis is in part concealed by one of the palpi accidentally overlying it in the preparation. Note lateral bending of the distal segments of palpi.

Fig. 4. *Anopheles punctipennis.* Head and appendages of female. Note long palpi and compare with short ones of female culex in Fig. 2. Note that antennæ in the females of both genera are alike, but different from those of the males which are also alike. The preparations are mounted in balsam.

PLATE III. Fig. 5. Wing of *Anopheles maculipennis*, showing the spots due to condensation of scales rather vaguely. Mounted in air under coverglass.

Fig. 6. Wing of *Anopheles punctipennis*, showing the yellowish-white spots on various veins. Mounted in balsam.

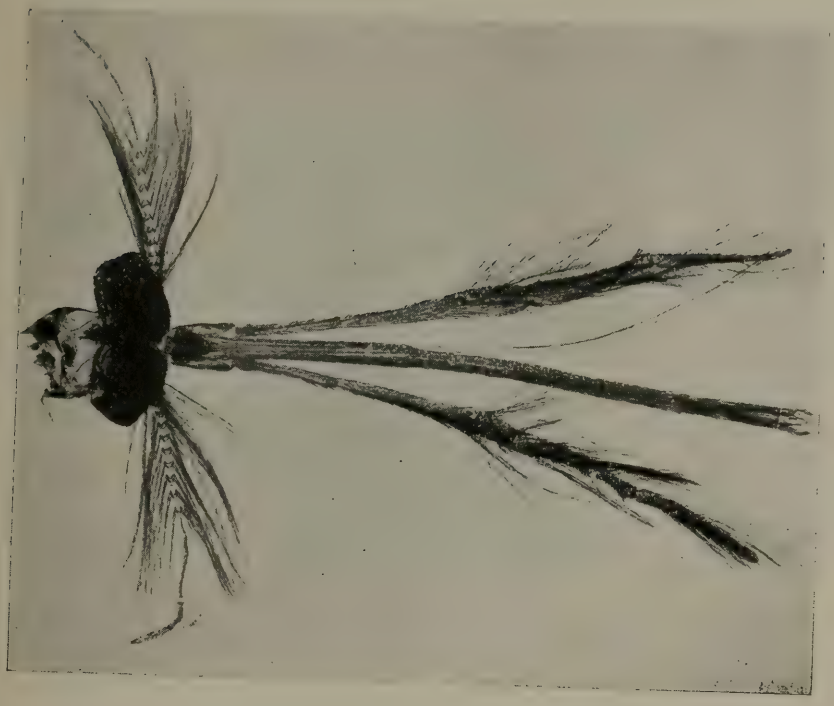

FIG. 1.
Head of *Culex stimulans*. Male.

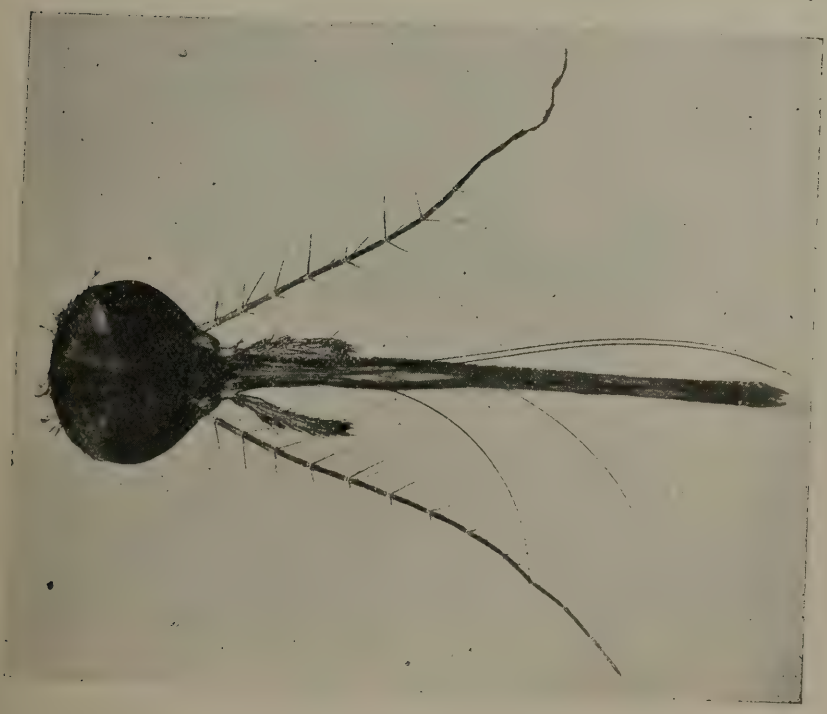

FIG. 2.
Head of *Culex stimulans*. Female

FIG. 3.
Head of *Anopheles maculipennis.* Male.

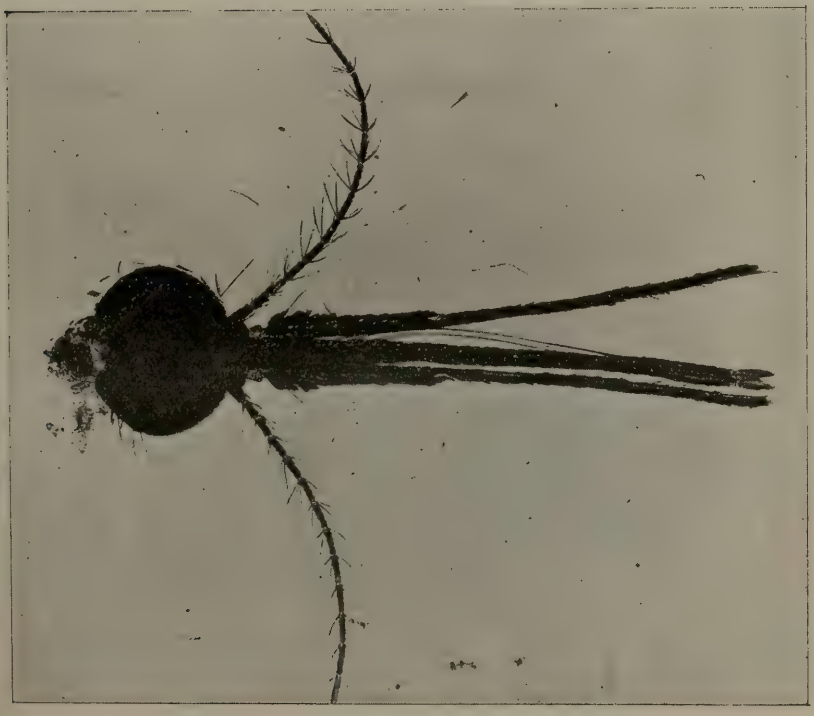

FIG. 4.
Head of *Anopheles punctipennis.* Female.

ARTICLE XXII.

THE RELATIONS EXISTING BETWEEN RESPIRATORY AND INTRAPELVIC DISEASES.

By DANIEL H. CRAIG, M.D.
OF BOSTON.

READ JUNE 10, 1903.

THE RELATIONS EXISTING BETWEEN RESPIRATORY AND INTRAPELVIC DISEASES.

In 1878 Professor Skene,[9] in his inaugural address, called the attention of the New York Obstetrical Society to the very common occurrence of prolapse of the ovary, and requested the members to devote their energies to the discovery of the causes of this lesion in cases in which the cause was not manifest and in which the prolapse was unassociated with either disease in the ovary itself or uterine displacement. During the ensuing year, Drs. Mundé[12] and Goodell[13] each presented monographs upon the subject, not only considering the causes, but also the course, symptoms, diagnosis and treatment. Various authors have contributed to the subject since and practically all have quoted the list of causes as given in the above papers, and it is because I feel that I can aid a cause which will account for cases not explained by any causes mentioned heretofore that I have undertaken the work of which I trust you will consider this as but a preliminary report.

Clinically, the condition is of immense importance, for Mundé[12] found uncomplicated prolapse in practically ten per cent. of his cases and they are even more frequent now. In the last 500 cases of pelvic disease personally diagnosticated, I have found prolapse of the ovary to play a clinical part as follows:

Total number of cases 500.

Cases in which ovarian prolapse was not a factor . . . . . 296 or 59 %

Cases in which the utertus was retrodisplaced, the ovaries *not* being coincidently prolapsed	62	or 12½%
Cases in which retrodisplacement and ovarian prolapse co-existed	69	or 14 %
Cases in which ovarian prolapse existed with no retrodisplacement of the uterus .	73	or 14½%
	500	100%

The increase of four per cent. in the frequency might be accounted for by the recent greater prevalence of respiratory diseases incident to the annual epidemics of influenza which had not occurred at the time of Mundé's paper in 1879.

My attention was first directed to the relations existing between respiratory and intrapelvic lesions by the fact that patients with pelvic lesions, and especially those with ovarian prolapse, were invariably made worse and their favorable progress under treatment arrested by the intercurrence of any cough-accompanied lesion. In accordance with this conception particular attention was given to the question of antecedent respiratory lesions in all cases in which ovarian prolapse obtained, and especially in those cases specified by Skene in which no cause was manifest. Positive histories were obtained too frequently to allow of its being considered merely coincidental. Very many histories might be adduced to substantiate this statement but I have chosen three which seem sufficient for the present need.

Case I.—M. B. M. Single. Æt. 20. Never pregnant. Never any pelvic infection. For a few months acted as clerk in a drug store. For two years has been "running down." Family history strongly tubercular, but father and mother and one sister living and free from tuberculosis. Three years ago had enlarged glands removed from cervical region. Three small glands now palpable on right. Takes cold easily and always has persistent cough following each cold.

Cough has at times persisted for months until phthisis was feared. About one year ago began to suffer from backache and leucorrhœa, and pain in iliac regions. Catamenia began at thirteen. Regular until recently. Painless. Duration five days until recently; now three or four days. Two napkins a day. No clots. Leucorrhœa variable in amount and not absolutely constant. Exertion increases leucorrhœa which is then thick and yellowish. Has used douches. Not much backache now, but severe at times. Appetite poor. Digestion fair. Bowels fairly regular. Micturition normal.

Physical Examination.—Chest and abdomen negative. Hymen intact but distensible. Nulliparous. Cervix long and conical. Uterus in good position, not enlarged nor tender. Some thickening of the right broad ligament. Left tube and ovary prolapsed and the ovary slightly enlarged [cystic?].

Case II.—B. E. B. Single. Æt. 24. Never pregnant. Family and past history irrelevant. Catamenia began at twelve. Rather irregular, often varying between three and five weeks. In spring of three past years has menstruated every two or three weeks. Painless. Duration six to seven days, using thirty napkins which are well saturated. Clots are frequent, their evacuation being accompanied with pain. Last April (date of history, Sept. 9, 1899) after a severe attack of la grippe in which she narrowly escaped pneumonia she suddenly began to feel pressure in the head, most persistent at the vertex. This vertical pain has been constant since. Worse at times. Often disturbs sleep, pain being worse at night. Can get no specific history. Paternal grandfather lived "a sporty life." Vertigo. Constant leucorrhœa, sufficient at times to demand protection, and of a thick, whitish character. Bowels regular. Micturition normal. General health good except that she is subject to winter cough. Appetite good. Digestion good.

Physical Examination.—Thorax and abdomen negative. Perineum and cervix nulliparous. Uterus slightly enlarged and slightly back of the normal axis and decidedly tender. No discharge from os. Right tube thickened but ovary not felt. Left ovary prolapsed at side of cervix and slightly movable, being apparently loosely adherent.

Case III.—C. S. Married eleven years. Æt. thirty. Has had two children and one miscarriage. Oldest child ten and the youngest three. Miscarriage resulted from a fall. First catamenia at fifteen. Always irregular, but much more regular the past two years. Duration seven to nine days. One to two napkins a day. Severely painful at times necessitating rest in bed. Pain principally in right iliac region. Nearly constant lumbar and sacral backache which is increased by walking and relieved by lying down. Constant but not excessive leucorrhœa. Severe and frequent headaches. Bowels constipated. Micturition normal. Nervous and irritable. General health poor. Has many times feared consumption and has been almost constantly under medical care for pulmonary troubles. Has spent winters in the south to avoid lung troubles. Has raised blood at times.

Physical Examination.—Lungs now clear. Heart normal. Uterus in normal axis and very little enlarged. Perineum good. Cervix lacerated, everted and eroded. Right ovary in the posterior cul-de-sac and enlarged, very tender and firmly adherent. Left ovary enlarged and soft.

These histories were chosen because in them the factors which have heretofore been most frequently assigned a causal rôle, perfectly correctly, are so markedly conspicuous by their absence. And here permit me just a word as to my position. I am not attempting to controvert the work already done on this subject but to amplify the knowledge by the addition of one more etiological factor. Without doubt every one of the causes thus far mentioned,

and especially those of Mundé [12] and the eleven enumerated by Goodell, [13] are all equally or more important.

Goodell, [15] in speaking of the causes of ovarian prolapse summarizes his views in one terse sentence in which he says that any condition which causes a persistent congestion of the ovary should be considered a cause of its prolapse. Authors are unanimous in stating that the most frequent cause is arrest of involution post partum, leaving the broad and ovarian ligaments in a relaxed, inelastic condition. In the above three cases, however, not one of the more active ordinary causal factors is present, and the only one of Goodell's eleven present, is the lacerated cervix which I feel sure was placed in the list mainly for the sake of completeness.

But two of these cases had never been pregnant nor infected and were virginal, showing no evidence of any form of sexual excitation. In the third no sign of subinvolution existed, any enlargement in the uterus being readily accounted for by the cervical and ovarian condition.

Study of the mechanism of cough will show that it most abundantly satisfies the causal requirements, first as to congestion, and secondly, as I hope to show below, as to the force necessary to push the ovary downward. Westbrook [27] has very clearly and concisely described the mechanism of cough, and the following is an abstract of his article:

The muscles of respiration, with the exception of the diaphragm and levatores costarum, are attached to and act upon the upper ribs; the expiratory group make their principal traction upon the lower portion of the thorax. The expiratory group, in which we are particularly interested, are, anteriorly and laterally the triangularis sterni above and the recti, obliqui and transversalis abdominis below. The action of the triangularis is simple and in this connection relatively unimportant. The action of the rectus is also simple. Its sole influence is to draw the sternum

downward, and so to diminish the size of the anterior wall of the abdominal cavity. The action of the obliqui is more complicated; their posterior portions which pass directly from the crest of the ilium to the ribs exert an immediate and powerful downward traction upon the thoracic walls, not only diminishing the size of the lateral walls of the abdomen but acting as adductors to the ribs, which have been put in abduction during inspiration. The more anterior portions have a crossed action and make diagonal traction across the abdomen. The upper portion of the external oblique and the middle portion of the internal oblique of the opposite side, attached as they both are to the intervening sheath of the rectus, are equivalent to one long diagonal muscle, passing from the ribs on one side to the crest of the ilium on the opposite side, and capable by its contraction of drawing the ribs downward and inward so as to contribute much toward the expiratory diminution of the thoracic and abdominal cavities.

The function of the transversalis is equally important. Its middle portion is attached by strong fascia to the transverse processes of the lumbar vertebræ; while the fibres below arise from the iliac crest and outer half of Poupart's ligament. Above it arises from the inner surfaces of the costal cartilages. The fibres of this part of the muscle pass horizontally across the abdomen and by the mutual attachment of those of the opposite sides at the linea alba, one continuous muscle is formed, the contraction of which strongly adducts the lower costal cartilages and thus diminishes the epigastric angle. The middle portion of the transversalis acts directly upon the abdominal wall. In its contraction the transversalis acts from the outer border of the quadratus lumborum as that muscle fixes its tendon in the lumbar region. It tends first to draw the linea alba toward the fixed point; but the antagonism of the opposite side prevents lateral displacement and simply allows the anterior

abdominal wall to approach the vertebral bodies, shortening the antero-posterior diameter. The muscular fibres intermediate between the anterior and posterior attachments make strong lateral compression. The lower fibres when they contract tighten the line across the abdomen and compress the intestines.

The posterior muscles are the erector spinæ, serrati postici and quadratus lumborum. When the erectores spinæ contract they draw the ribs forcibly downward toward the pelvis, lessen the transverse and antero-posterior diameters of the thorax and at the same time tend to shorten the perpendicular axis of the abdomen.

When these powerful muscles of expiration are spasmodically contracted, as in the act of coughing or sneezing, their first effect is to adduct and depress the ribs and by so doing diminish the size of the thorax in all its diameters. But as the abdominal walls only yield in the upward direction, and as the contents of the abdominal cavity are practically incompressible, its roof, the diaphragm, which is relaxed during expiration, must ascend and encroach upon the thoracic space from which air escapes to compensate for the diminution in its size. The second effect of the expiratory contraction is to lessen the circumference of the abdomen. As the contents are incompressible, and as the sphincter muscles, by their contraction, prevent the escape of the contents of the hollow viscera, the decrease in the transverse and antero-posterior diameters must be compensated for by an increase in its long diameter, another factor in the ascent of the diaphragm. Further, during the expiration of cough the glottis is partly closed, thus producing considerable resistance to the egress of the air.

Thus by making a more less rigid walled cylinder of the abdomen, of which the top is to be elevated by internal pressure, the ascent of this top being resisted not only by gravity but also by a partial closure of the glottis, it is

readily understood that the bottom of this cylinder is struck a veritable blow by *contre coup*. Speaking of this effect Westbrook says: "In the pelvis the inferior hæmorrhoidal veins and those of the uterus, vagina and bladder are sometimes so turgid that slight ruptures and hæmorrhages occur, particularly from the uterus, causing a bloody, serous discharge from the vagina during cough. Involuntary urination also sometimes results from the sudden downward pressure, especially in women."

Weiss[76] (Heilkünde, Vienna), as evidencing the expulsive power of this muscular mechanism says: "The expelling speed of the air varies considerably. In quiet respiration it passes through the glottis at 125 cm. per second, and the pressure supports two mm. of mercury. During violent expiration and coughing, the pressure rises to 150 to 200 mm. and the speed is said to exceed that of the wind in a storm. It is said to be as much as 100 meters a second."

Westbrook's article was written apropos of respiratory diseases, but if it had been his desire to defend such a contention as is suggested by the present paper he could hardly have written more directly to the point.

In operating in or through the vagina no one can fail to note the marked rise and fall of the vaginal vault with each respiration, and if perchance the patient cough or vomit the specula are not infrequently forced entirely out of the vagina. This impulse caused by cough is also plainly evident if a patient coughs during a digital examination.

Moreover the effect of respiratory influence has long been recognized in various pelvic lesions, particularly herniæ and uterine displacements, but no mention, so far as I am able to learn, has been made in connection with genuine respiratory diseases. This is true of both monographs and text books, both old and recent. The respiratory influence most frequently invoked is invariably a secondary one in

connection with either the straining due to muscular exertion or that due to intestinal diseases. Almost every author who has written at all comprehensively of displacements of the pelvic viscera has cited straining as a cause. Yet the effect of straining on the pelvic organs is entirely respiratory, being wholly due to the involuntary holding of the breath in inspiration which invariably accompanies the muscular strain. The principal difference existing between the mechanism of strain and that of cough is in the degree of force, and that in straining the glottis is completely closed, with or without the relaxation of the sphincters.

The clinical evidence appearing so conclusive the actual demonstration and measurement of the relation existing between respiratory causes and pelvic effects was all that was lacking. To supply, very crudely it is true, this want, I have constructed this apparatus which, notwithstanding its humbleness, I have christened the pelvio-respirometer.

By its use I have been able to read exactly the force of the downward impact upon the pelvic structures resultant from various respiratory movements. Readings have not been made from a large number of subjects, because, as I expected, I found that the figures varied only within very narrow limits, and the readings given represent the mean average reading with the maximum and minimum extremes only an ounce or a fraction of an ounce above or below.

Before giving the readings, however, I wish to say just a word as to what was to be expected. Many of you have undoubtedly, as I have, seen the so-called "lung testing" machines commonly placed in public places, the dials of which show how many pounds pressure can be created by forcible expiration. All that I have seen are shamefully mendacious. The average expiratory power for an adult man is one and one-half pounds. By training and special gymnastic expansion of the chest a few ounces can be gained. In the adult woman the average expiratory power

is eleven and one-half ounces. The maximum personally noted being fourteen ounces. With this explanation I submit the readings obtained by the use of the pelvio-respirometer.

Downward pressure is produced upon the pelvic viscera as follows:

Ordinary inspiration causes a downward intrapelvic pressure of . . .	1.85 ounces
Ordinary expiration a vacuum of .	7-16 inch
Forced inspiration a pressure of .	2.56 ounces
Forced expiration a vacuum of .	13-16 inch
Slight cough a pressure of . .	7.5 ounces
Violent (artificial) cough a pressure of	16.3 ounces
Moderate straining a pressure of .	6.83 ounces
Strenuous straining a pressure of	10.95 ounces

So that the conditions might as nearly as possible simulate the ordinary conditions, these readings were all made with the patients sitting erect and with the corsets on. One other fact I wish particularly to specify: no readings have been made in cases in which a genuine hard cough due to actual respiratory lesions existed. Much as I desired to do this, and also to measure the pelvic effects of sneezing, I feared to allow my enthusiasm to carry me thus far on account of the possibility of sufficient pressure being brought to bear on the fluid in the vagina to force it through the fimbriated ends of the tubes into the peritoneum. I mention sneezing because but for the trespass upon your time I should have detailed one history in which an attack of hay-fever was the direct exciting cause of the symptoms which were due to an uncomplicated prolapse of the left ovary.

The effect of genuine hard cough of bronchitis, for example, certainly far exceeds that of the counterfeit, and yet I think you will agree that a persistent repetition of such force as has been shown to be engendered in the artificial cough would be quite sufficient to in time drive the ovary down.

Moreover, a study of the topographical anatomy of the pelvic contents shows still further reason for this action of cough. Prolapse of the left ovary is slightly more common than of the right, the reason usually assigned being its greater proneness to congestion owing to its venous return circulation. This reason is undoubtedly active, and is only supplemented by the relations of the sigmoid flexure as described by Deaver.[78] He says: "Normally, owing to its long meso-sigmoid, the greater part of the sigmoid is an occupant of the pelvis. *Here it lies in contact with the bladder, the uterus and its appendages*,* and those coils of the small intestines which occupy the pelvis." The attachment of the sigmoid being posterior, if it is in relation with the bladder it must cross the top of the left broad ligament in an antero-posterior direction. Consider what must occur when this sigmoid is driven downward by the effects of coughing, or even straining, especially if this sigmoid is loaded, as so frequently occurs in women. But this downward impact represents only one or two equally important factors. According to Westbrook, the mechanism of cough is such as to exactly supply Goodell's one general predisposing cause, namely congestion.

We have also thus far been considering the effect of cough on normal ovaries. Consider now how much this effect is heightened in the instance of an ovary already predisposed to prolapse by preëxisting lesions. Consider, for example, its effect upon an ovary enlarged, heavy and turgid with the physiological congestion of menstruation, or enlarged and heavy from the presence of a false corpus luteum, or again an ovary but imperfectly sustained by broad and ovarian ligaments weakened by arrested involution, and does not the evidence seem conclusive?

And of all the causes of ovarian prolapse respiratory lesions are certainly amongst the most important. First,

* The italics are my own.

because in our New England climate catarrhal conditions of the respiratory tract, accompanied by more or less persistent cough, are so common as to have by familiarity bred a certain degree of contempt, especially in the laity. Secondly, because this is a cause which does not act insidiously and unsuspectedly, but frankly and openly, thereby offering the greatest possible scope for the highest attainment of medical science; namely, the prevention of disease.

But before proceeding to the consideration of the prevention of complications, I wish to offer one other suggestion. Throughout the literature of the subject I find comparatively frequent reference to congenital ovarian prolapse. My suggestion is that these cases may be better accounted for. In congenital malformations several factors generally act conjointly, and it is anatomically difficult to understand how any such action can produce *downward* and backward congenital ovarian displacement. Ovaries are unquestionably congenitally displaced anteriorly, as in Engelmann's [15] cases, and into hernial sacs, but where such conditions as persistence of the lumbo-ovarian ligament or the existence of the appendiculo-ovarian ligament of Clado obtain, the ovary is maintained above its normal level.

May not, at least a part of, these so-called congenital prolapse cases be due to the congestion and pressure effects of respiratory diseases—for example, whooping-cough; during childhood, no symptoms manifesting themselves until after the maturation of the organs?

If we grant that the above deductions are correct, at least in part, much can be done, especially in women known to be the subjects of pelvic lesions, by prompt and efficient attention to the respiratory lesions; and if for any reason it is inadvisable or impossible to inhibit the cough, much may be done to lessen its evil effects upon the pelvic viscera. And I say pelvic viscera advisedly, for while I

have confined myself to-day entirely to the ovarian conditions you can all easily see the concomitant influence on the other pelvic structures.

The prevention of pelvic complications of respiratory lesions rests not with the gynecologists but with the general practitioner, for it is he who sees the cases long before he needs to refer them to us.

The following suggestions may, with others better known to the general practitioner than to us, serve to avoid such complications.

The congestion of menstruation acting in conjunction with that of cough is always harmful and even the nulliparous should be guarded against it. As corsets lessen decidedly the normal abdominal resiliency and go far toward destroying the so-called retentive power of the abdominal mechanism, they had better be proscribed during any severe and long persisting cough-accompanied lesion, especially during the catamenia.

By requiring a patient to assume the prone position for a few minutes after a violent coughing spell, disengorgement of the pelvic vessels is favored and gravity assists the ovarian supports.

If ovarian, or pelvic, involvement is suspected much good may result from the employment of the pelvic respiratory massage as suggested by Williams. This consists in having the patient assume the genu-pectoral or knee elbow position and aspirate the pelvic vessels by slow forced expiration about fourteen times a minute.

Complications may also be avoided in those already the subject of pelvic disease, by insistently warning them of the necessity of avoiding a cough and the importance of prompt and efficient attention should such a condition arise.

ADDENDUM.

Having pursued this study thus far, which by the way I consider as probably only the beginning, I naturally de-

sired to know if the downward impact of practically one pound, as shown by the pelvio-respirometer, was really sufficient to throw the ovary down. While I do not consider my data as conclusive as yet, and shall investigate the matter further, I have, since the completion of the paper, thanks to the kind co-operation of Professors Thayer, Cushing and Leary, been able to make a series of investigations on the cadaver and learn that in the dead subject a pressure of ten ounces is quite sufficient to carry the fundus of the uterus to the bottom of the cul-de-sac of Douglas. A slightly greater force is requisite to so completely prolapse the ovary. It is carried down to the level of the utero-sacral ligaments by a pressure of twelve and one half ounces, and is completely prolapsed by a pressure of fourteen ounces. The normal vital ligaments would undoubtedly act slightly different from those on the cadaver, but if the respective resistance imparted to the hand is of any value the ligament on the cadaver seemed much more resistant than are those ordinarily felt in operating, but of course totally lacking in resiliency.

Taking these findings as a basis it appears that the force engendered by cough is slightly in excess of that required.

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ARTICLE XXIII.

PROBLEMS OF CLINICAL ANATOMY.

By THOMAS DWIGHT, M.D.
OF NAHANT.

READ JUNE 10, 1903.

PROBLEMS OF CLINICAL ANATOMY.

My attention was called very early in my career, by a murder case in which I figured as an expert, to the fact that all men are not made alike. This started me on my hobby of anatomical variations, concerning which I have had the honor of speaking before this Society more than once. Years of observation have taught me that there is a practical clinical side to these studies. Just as the expert hesitates in estimating the height of a body from a single bone, because he is not aware how much the body in question may have varied from the norm, so the practitioner with his patient before him has often wondered whether some uncommon variation of structure might not be the cause of the impossibility of making the symptoms square with what, according to the books, should be the condition of affairs. There is a wide and but little explored area between the domains of anatomy and pathology; a debatable ground passing alternately under the sway of each of the claimants, which contains very valuable mines of information. It is not pure anatomy nor is it pathology. It treats of conditions which for the most part are not often recognized during life, but the knowledge of which would have helped the practitioner in many a strait. This knowledge, I may add, is of special importance to the surgeon. The purpose of this paper is to point out certain groups of peculiarities which may be of clinical importance. They include not only variations of structures, but also

changes which are the more or less constant results of disease. Increasing knowledge will, I am sure, show us that certain pathological conditions are almost necessarily associated with certain morphological changes. Moreover, the results of certain series of observations are, I think, establishing the law that certain pathological conditions have their origin in some peculiarity of development. Thus certain lesions from trauma occur only when there is an abnormal weakness due to peculiarity of structure. It is worth while to know that certain parts of the skeleton are particularly subject to errors of development, though we may be still ignorant of the cause. Why, for instance, is the last lumbar vertebra the only one in which the arch occasionally, especially in savage races, remains ununited with the body? Or, to take another and more practical instance, for it may effect the motions of the head and be accessible to the X-rays, why are the second and third cervical vertebræ especially likely to be more or less fused, and consequently underdeveloped? Why is the third metatarsal the only one that in the absence of any disease is fused with the tarsal bone supporting it, and why is this fusion limited to the plantar part of the joint? I shall follow none of these topics very far on this occasion, for that calls for minute details which would be out of place to-day. I have, indeed, already written on some of these points and have other papers in the course of preparation and publication. To-day I invite your attention merely to instances illustrating principles. I hope to show that they are of practical importance; nay more, that the deductions from some of them are far-reaching.

As a distinctly clinical point let me call attention to the symptomatology of aneurism of the right subclavian artery. The recurrent laryngeal nerve which winds round it is the chief motor nerve of the right half of the larynx. A certain more or less characteristic paralysis of the muscles of

the right half of the larynx is the necessary consequence of an enlargement of the artery at the place where the nerve loops under it. Nevertheless there may be an aneurism at the very place at which it should give rise to this symptom without its appearing. Why? Because in a certain proportion of cases the right subclavian artery, owing to a deviation from the usual course of development, arises the last of the large branches of the arch of the aorta, and passes behind the œsophagus to its destination. In these cases the inferior laryngeal nerve is not recurrent, but runs from the vagus in one or two bundles directly to the larynx, having no relation whatever to the subclavian artery. I expect to meet with this arrangement at least once a year in the dissecting room. Here is a pretty instance of it.

Let us turn to peculiarities which are the direct results of pathological conditions. Look at these specimens of severe Pott's disease. Note how the aorta is as it were half coiled round the spine, lying in transverse folds with sharp angles. These specimens have been already described in print. The stoppage of the circulation by the compression of the vessel at these angles has been given as an explanation of the sudden death that occasionally occurs in this disease. It should be known that this is the most probable course of the aorta under these circumstances. Here is another and a very different specimen concerning which there might be a good deal of discussion as to whether it is the result of a pathological change or of a congenital malformation. I may not discuss it because an article on it is about to appear in a medical periodical. Let me therefore merely show you this cast of a very remarkable hour-glass stomach which I had the good fortune to find in a hardened body. Plenty of hour-glass stomachs have been shown before now, but the true shape and relations can be learned only when the body has first been hardened. The appearance of this one is, so far as I know, unique.

I leave you to judge whether or not such an observation is of clinical importance.

Orthopædic surgery is, perhaps, the most fruitful field of all for this line of research. Let us think for a moment on all the queer positions of the head. Nothing is more characteristic than its poise. I imagine any portrait painter would say that not only are there certain types of head and face, but that each of these is associated with some peculiarity in the holding of the head. I do not say that structure determines function; for, beyond question, function modifies structure. Though some positions of the head imply structural peculiarities, certain long-continued postures must have their effect on the original structure. This question is full of difficulties; but what I want to insist upon is that a certain carriage of the head, when once it has become thoroughly habitual, predicates a certain antomical condition which it imports the practitioner to understand. Which is the cause of the other, and how much one may react on the other, is not clear. Neither is it easy to say when we cross the dividing line between the peculiar and the pathological.

I have here several specimens which I again pass over lightly as I hope to discuss them more thoroughly hereafter. Look at this fusion of the atlas with the occiput. It is symmetrical; the whole of the atlas is developed, only the condyles and the skull are absolutely fused. Was this congenital or acquired? Evidently such a condition must give rise to a peculiarly stiff carriage of the head with, one would think, limitation of the motions. Here is another specimen in which one lateral half of the atlas is underdeveloped and fused with the skull while the other half stands out free. It is a modern skull which came into my possession only a few years ago. Here is another which would be almost its exact counterpart were it not that the fusion is on the opposite side. It is from a mummy of the

twelfth Egyptian dynasty, and at least four thousand years old. Many years ago I bought in Paris the separated bones of a head. Among them was this occipital which bears on the left a stout process descending from the under side external to the condyle. I was at first at a loss to know what it was, but soon learned that it is known as the *paramastoid process* which is found in many mammals, and is particularly large in ungulates and rodents. It is common enough in man as an insignificant projection, but this one was remarkable for its size and for being apparently fitted to articulate with the transverse process of the atlas. During the past winter I have found it again, and this time can show you the neck. The paramastoid process rests indeed against a corresponding surface of the transverse process of the atlas. The specimen is from a man of sixty-eight, and again it occurs on the left. Now this condition was evidently congenital. It is self-evident that it must have modified the movements of the head. That it involved a peculiar position is highly probable. Who would have suspected such a condition had the man come as a patient? Had the man been X-rayed would there not have been talk of an exostosis or of a tumor? I must beg leave to omit entirely what is perhaps my best case of peculiar conditions at the junction of the head and neck. I hope within a year to publish all these and others in detail and together.

We come now to some of the most practical considerations connected with this subject. X-ray work has brought a new factor into surgery. Its help can hardly be overestimated; but we must beware that it does not sometimes lead us astray. I do not refer here to the ordinary difficulties in the interpretation of the X-ray negative, of the necessity for instance of knowing which side of the object was nearest to the bulb and of allowing for the distance. These and other points are for the expert. I refer to the danger of the misinterpretation of peculiarities of structure. The

specimen just shown is a case in point. It is remarkable how little is known of far more common variations. The late Professor Pfitzner wrote of his astonishment at finding that a distinguished surgeon was utterly unaware that the epiphysis which forms the end of the acromion may remain permanently separate from the rest of the bone. Not only would it suggest a fracture under the X-rays, but it might of course be detached by violence that would not break a normal bone. This naturally suggests the burning question of fracture of the scaphoid bone of the wrist, which I think no one had ever heard of before the X-ray. Now it occurs all the time. My friend Dr. Codman was kind enough a while ago to show me a room full of patients with fractured scaphoids at the Massachusetts General Hospital; and yet I still believe that, putting aside extraordinary cases of injury, a normal scaphoid is never broken, and that the separation into two parts, which undoubtedly occurs, is the result of violence acting on a bone composed of two pieces united merely by cartilage. This also I hope before long to establish.

The late lamented Professor Pfitzner of Strasbourg was the true pioneer in the scientific study of the bones of the wrist and ankle. He declined to be limited to the usually accepted number of bones and declared that there are many other true ones, some of which but rarely appear, while others are almost constant in the early cartilaginous stage. Some lose their identity by absolute degeneration, but more commonly this occurs by fusion with one of the neighboring cartilaginous centres. A case in point is what we commonly call the styloid process of the third metacarpal which projects from the radial side of the base of that bone between the os magnum and the trapezoid in a way that makes the disarticulation of the third metacarpal particularly difficult. Now this styloid process is really a true carpal bone, the styloid, which usually to be sure joins the

metacarpal, but which occasionally joins the os magnum or the trapezoid, thereby considerably modifying the articular lines, or which may indeed persist throughout life as a distinct bone. It is to be noted that such a bone which usually fuses with a certain recognized one, but which exceptionally may fuse with another, is also capable of fusing with both. This accounts for the tendency of particular bones to be fused. At the beginning of this paper I asked why the third metatarsal was particularly likely to be fused with the supporting tarsal bone, and why this always occurs on the plantar side. The answer is: owing to the existence of a bone of this nature deep in the sole of the foot. Both Pfitzner and I myself have seen this several times in feet which present no sign of any pathological process. I have a specimen of it in a beautifully formed foot of a girl of nineteen.

Now it is evident that the persistence of such an occasional bone may give rise to X-ray negatives that are liable to misinterpretation. Many years ago, before the X-rays had been thought of, an excellent anatomist and surgeon thought that he had found in the dissecting room a fracture of the astragalus, because the external tubercle at the back of the astragalus was distinct. This is now known as the *os trigonum*, which may be found in all degrees of fusion, from complete distinctness to absolute incorporation with the astragalus. No one knows how many of these distinct centres of the wrist and ankle there may still be to discover. I had the luck a year or more ago to find a new bone in the ankle (the *os intercuneiforme*), and I think I have found a new one this winter in the wrist. To be sure these discoveries at first may seem of no more value than that of one more asteroid or of a one-horse comet, which nevertheless are telegraphed all over the world; but I am sure that many of them have their very practical significance. Conversely the fusion of bones usually distinct is of practi-

cal importance. I have just mentioned one way in which it occurs, but it is not likely that it is the only one. Fusion of distinct bones is not only a disturbing circumstance to the operator who expects to sweep his knife gracefully between them, but it is of greater importance to the orthopædist who is studying the relations between structure and, let us say, flat-foot. Thus the os calcis occasionally is connected by cartilage or fibro-cartilage with the outer end of the scaphoid. Though I believe the opposite opinion has been maintained, I think from my experience that it is associated with a high instep. What influence it may have on the movements of the foot is a more abstruse problem.

And so on, and so on:

> "Though I'm anything but clever,
> I could talk like this forever,"

and keep on showing you peculiarities which once were (perhaps still are) considered mere curiosities, but which in point of fact are alike of great scientific and of great practical importance. Let no one say that anatomy is exhausted. On the contrary we are just entering on a new era, and on one which concerns especially the practitioner who would be eminent.

ARTICLE XXIV.

RUPTURE OF THE QUADRICEPS EXTENSOR FEMORIS MUSCLE.

By HALBERT G. STETSON, M.D.

OF GREENFIELD.

READ JUNE 9, 1903.

RUPTURE OF THE QUADRICEPS EXTENSOR FEMORIS MUSCLE.

It occasionally happens that the country practitioner runs across something rare or at least unusual in a medical or surgical way. A condition which perhaps he recognizes, but for the description and relief of which he looks in vain in his limited library. He may, perhaps, find some mention of the particular condition with which he is called upon to deal, but for any real practical help or aid he may look in vain. His own library fails him because not sufficiently extensive and he is out of reach of the larger medical libraries of the city. He is then called upon to make use of his own talents and common sense, and his results will depend very largely upon his exercise of those qualifications.

Rupture of the quadriceps extensor femoris muscle is one of these unusual conditions. An accident at least not common, and many surgeons in large practice would, I believe, say rare. At least but little mention is made of the subject in modern text books of surgery, and many of them do not speak of it at all. Agnew, in his Principles and Practice of Surgery, third edition, says he has met with but two cases, and his experience, even at the time he wrote that, was a very extensive one. Connor, in Ashhurst's System of Surgery, speaks in a general way rather briefly of rupture of muscles, but does not go into the details of rupture of any particular muscle or group of muscles. Dennis does not mention the subject at all. The American Text Book of Surgery speaks in a general way of muscular

rupture, as does Da Costa. Wyeth in his Text Book, and Monks in the International Text Book of Surgery, allude particularly to rupture of the quadriceps and to its etiology, symptomatology and treatment. On the whole, the knowledge to be gained by the general practitioner from those text books most likely to be in his library would be rather small.

As I have said, rupture of the quadriceps extensor muscle is not a common condition. It is most often of traumatic origin. That is, the patient in going down stairs, or down a steep incline, loses his footing and in his effort to save himself strongly contracts his quadriceps, which was previously very firmly contracted, with the result that it ruptures, or the patella is broken; and the determining factor may be the comparative weakness of the muscle or tendon. Konig, quoted by Klein, describes two ways in which this rupture may be produced. Either the actively contracted quadriceps is suddenly strongly stretched, as when one descending a mountain slips and falls backward; or the passively stretched muscle undergoes an active contraction as when one falls over a step. The weight of the body presses the thigh against the leg, forming a very acute angle at the knee joint. The stretched quadriceps contracts to avoid overstretching, and a ruptured quadriceps tendon or fracture of the patella results. Cases of rupture of the quadriceps, as of other ruptures of the body, have occurred following typhoid fever, and other prolonged pyrexias, from slight strain only, and without the knowledge of the patient; but of these I shall say nothing. Certain factors, however, have at times seemed to play a part in producing weakness of the muscle fibre, rendering the rupture easier than would seem to be normal. Alcoholism and arterio-sclerosis would naturally be looked upon as such factors. Evidences of a diseased condition of the muscle itself has seldom been found. Maydl reports fatty degeneration of the muscle

in one case. Hafeman found tabes dorsalis in two cases. Kohl and Wunsch saw cartilaginous bodies imbedded in the tendon. Kohl found beside three solid masses in the tendon; also an analagous body free in the joint, and he considered the cause to be a chronic athritis. Wunsch found a cartilaginous formation on both sides and diagnosed with probability an exostosis of the tendon. In a case reported by Vulpius there was very marked fatty degeneration of the tendon confirmed by miscrocopical examination; but these were only single and unusual cases. Most of the cases examined show no pathological or degenerate change whatever.

It seems to be most frequently met with in males. In ninety-eight cases collected by Walker, ninety-one were males, and seven females. This great preponderance is no doubt due to the greater muscular activity of life followed by the male sex. It occurs slightly more frequently as age advances, the majority of the cases reported being over fifty years of age.

Concerning the location, there seem to be no factors which tend to make one limb any more liable to this rupture than the other. It seems to occur as frequently upon one side as upon the other. Cases have been reported where both muscles have been ruptured simultaneously; and both muscles have been ruptured separately, an interval of several months or several years intervening.

The point of rupture is most apt to be at the upper margin of the patella, although it often occurs higher up. In its relations, this muscle lies immediately over the joint cavity of the knee, and when the rupture occurs at the upper margin of the patella, the joint capsule is very apt to be opened. Walker says that the joint capsule extends upwards behind the rectus tendon for a distance of five centimetres; and that rupture of the muscle at any point within this distance is very liable to involve the joint.

The occurrence of rupture is usually indicated by a sudden sharp, stinging pain, accompanied by a snapping sensation as of something giving way, and associated with complete loss of function if the rupture be complete; if not complete, if the lateral portions are still intact, or if a portion of the fascia is still intact, some power of extension will still remain. If seen soon after injury, the deformity is characteristic. The patient is unable to extend the leg, the upper edge of the patella is felt and is freely movable in every direction except upward; there is a marked depression above in which the condyles of the femur can be plainly felt. Above this depression is a tumor caused by the retracted muscle. There is but little pain usually, and only moderate tenderness. There may or may not be, coming on early or late, discoloration of the skin produced by extravasated blood. Extension, and flexion of the leg to an angle of 45°, cause little pain. Seen later, that is from one to fourteen days after the injury, the gap so noticeable above the patella at the time of the traumatism has become filled in with extravasated blood and is much less noticeable.

The diagnosis should not be difficult in cases seen early. The loss of the power of extension of the leg, patella easily made out and movable in all directions except upward, a depression admitting one or more fingers above the patella; these objective symptoms, together with a history of muscular effort and the subjective symptoms of sudden pain and a sensation as if something had snapped would, seemingly, make the diagnosis easy. McCosh believes, however, from a study of the reported histories of such cases, that in many of them the injury was overlooked because the examining physician was not alive to the possibility of such an accident.

And now comes the difficult problem of all to solve. How shall this injury be treated? Shall we rely upon mechanical means to bring about coaptation with the hope of a firm, fibrous, union and a nearly functionally perfect leg? Or shall

we invite the dangers attendant upon surgical manipulation of the knee joint, and cut down upon the ruptured muscle, bring the ends into opposition and stitch them with some suitable material?

Other things being equal, the operative method would seem to be the preferable method in the hands of the skilled surgeon and under favorable surroundings. Maydl in fifty-six cases of complete rupture of the quadriceps, states the results in forty as follows: In twenty-four, or sixty per cent., complete recovery followed. Nine of the remainder acquired a useful leg. The other seven were unsatisfactory. Walker states that of twenty-three complete ruptures of the quadriceps in which he was able to give results, in sixteen, or seventy per cent., complete recovery followed. In five a useful leg was obtained, and two cases were unsatisfactory. Compare this report with Walker's report of his operative cases, twenty-one cases so treated and nineteen, or ninety per cent., complete recoveries.

Walker also compares the time occupied in bringing about complete recovery by the two methods. In speaking of his series of twenty-three cases of complete rupture, treated by the mechanical method, sixteen, or seventy per cent. made a complete recovery. Of these sixteen cases, eighteen per cent. recovered in three months, thirty-one per cent. in six months, and fifty per cent. in one year. Of his series of twenty-one cases treated by the operative method, nineteen or ninety per cent. made complete recovery. Of these nineteen cases, fifty-six per cent. recovered in three months, and one hundred per cent. or the total number recovered in six months, showing a large saving of time to the patient by the operative method in skilled hands.

Unfortunately, however, rupture of the quadriceps extensor muscle does not always occur in the young, strong, vigorous adult, the kind to whom you look for favorable operative results. I have before spoken of the fact that a large

number of these cases occur after the age of fifty years. From that age on we look for degenerative changes—arterio-sclerosis and its very common accompaniments, tense, wiry, blood-vessels, cirrhotic kidneys, enlarged prostate,—to say nothing of the greater liability supposedly, of failure of union of the approximated ends.

Again, it is not always possible to bring about a meeting between the patient suffering from the injury under discussion, and the skilled surgeon.

Under these circumstances, it would seem to be perfectly proper treatment for the general practitioner to at least try the effect of the mechanical method of treatment. Many of us would certainly hesitate to molest the knee joint unnecessarily. McCosh, who cannot in any sense be accused of favoring the mechanical method of treatment, in his paper upon this subject, advises against operative interference unless conditions are most favorable, believing that the non-operative plan of treatment should be tried, at least until more favorable conditions can be obtained. And he further says that a delay of several weeks does not contra-indicate the operation. I believe there is one danger from non-operative treatment which must be thought of, and which might become troublesome unless guarded against, that is, inactivity atrophy of the quadriceps. But early massage and passive motion would probably, to some extent, delay if not prevent this change.

All agree that in cases of partial rupture in which the lateral portions of the muscle are still intact, the mechanical treatment is all that is necessary. Most men, I believe, are in favor of mechanical treatment in cases where the distance between the divided ends is not more than one inch, and where the joint has not been opened. In those cases where the distance between the divided end is more than one inch, or where the joint has been opened, operation would seem to be the proper course to pursue; but

even here the general condition of the patient would be a large factor in finally determining upon the proper plan of treatment. And in those advanced in years and presenting the changes incident to age, even there the mechanical method of treatment might be thought advisable.

Particular care should be given to the application of the mechanical method. The patella should be pulled up as far as possible, and held in place by adhesive strips. The leg should be bandaged from the ankle to the patella, care being taken to have the bandage reinforce the plaster strip as far as possible. Beginning above at the upper portion of the thigh, bandage downward firmly, the object being to push down the retracted end of the muscle into nearer apposition with the patella. A long, posterior splint extending from the ankle to the gluteal fold should be applied and the leg strapped firmly to it. Cold applications to the knee if there is much extravasation of blood, foot elevated about six inches above the level of the pelvis. After five or six weeks, massage. After eight weeks, passive motion of joint and crutches. The time of recovery based upon reported cases should be expected in from three to twelve months.

The operative method consists in cutting down upon the separated ends and uniting them, either with silk worm gut, cat gut, kangaroo tendon or silver wire. If insufficient tendon remain attached to the patella, then drilling through the upper portion of the patella and attaching the upper fragment to the patella. Elevated position of the foot for two or three weeks, passive motion, etc., as with mechanical treatment.

Walker concludes his admirable paper with six conclusions, four of which would seem to be most useful suggestions for the general practitioner in deciding upon the proper method of treatment for this particular injury.

"First. In recent cases in which there is not much

effusion, where the joint is apparently not opened, in which the separated ends can be approximated and retained by suitably adjusted pads, the mechanical treatment may be favorably considered. In the hands of an intelligent practitioner, this method may be expected to bring about a complete recovery in the larger number of cases. From nine to twelve months will be required to reëstablish fully normal functions.

Third. The skilled aseptic surgeon who promptly resorts to the operative method in suitable cases, though age and vitality of each patient must be most carefully considered, may quite reasonably hope to obtain a better result in the larger number of patients, and save his patient three to six months' time.

Fifth. Where the separation is greater than one and a half inches, or where the case has not recovered under mechanical treatment, the operative is indicated.

Sixth. As the length of time required for treatment is a very important consideration, so the operative method which has diminished this period and also succeeded in a large number of cases without increasing the danger, will be more often indicated and more frequently applied in the hands of the skilled surgeon."

My attention was particularly called to this condition, by the following case: S. B. S., retired, seventy-one, married, never ill. On September 7, 1902, in going down stairs his slipper caught on the stair and he was thrown forward. He made a strong effort to save himself, and felt something give at his knee. Upon getting up he was unable to stand upon the leg, although the effort did not cause severe pain. The knee was "wobbly," as he expressed it, and uncertain; slight swelling occurred at once about the knee. Seen one-half hour after the injury. Left knee somewhat swollen; swelling not confined to the synovial cavity. Patella drawn downward about half an inch. Immediately above

the patella is a depression allowing two fingers to be laid in; condyles of the femur plainly felt; above the depression is a moderate enlargement of apparently muscular tissue. Flexion, extension, latero-flexion, not accompanied by much discomfort. Patient can flex, abduct, and adduct, but cannot extend the leg. Treatment, posterior splint applied, with a compress of lead and opium wash, moderately firm bandage. On the 8th, the patient was seen in consultation by Doctors Twitchell and Zabriskie of Greenfield in reference to the advisability of adopting the operative plan of treatment. In view of the fact that the patient was the victim of some arterio-sclerosis, and had for some time had some urinary retention due to an enlarged prostate, it was deemed best to try the mechanical treatment for a time, having in view the operative plan of treatment at some future time, if satisfactory results were not obtained by the mechanical. The patient was allowed up in a wheel chair. The leg was kept in splints until the last of October, when massage and passive motion were begun. On November 1st, the patient was walking about with the posterior splint still on. Without the splint he can bend the knee and has some power of extension. Ordered continuance of passive motion. On the 28th of January, 1903, examination shows extension to be strong and forcible. Is able to kick vigorously; motion is good and unimpaired. As compared with the opposite leg, it would seem that he had from seventy-five to eighty per cent. of normal function. Patient says that he can see improvement still going on. Patient shows no lameness, climbs in and out of carriage easily and attends to his usual duties apparently as easily as before the accident.

DISCUSSION.

Dr. S. J. Mixter, of Boston: I should be happy to say something on this very interesting paper, but the fact is I have never had a case of rupture of the quadriceps extensor; that is, a complete one or anything near complete. I have had partial ruptures. I have seen several ruptures in the practice of other men. None of these have been operated on; they have been treated mechanically with good results. A distinguished member of The Massachusetts Medical Society had such an accident at the time I was a student. He was treated by Dr. Bigelow, and got a very good leg. I think I am correct in saying Dr. Bowditch had that accident by jumping from a horse-car. At that time of course operative procedures were not so common as now and on account of his age, at any rate, it was best to follow a conservative line of treatment. He made an excellent recovery. Slight ruptures I have seen. It seems to me that ruptures of the quadriceps extensor tendon are very like fractures of the patella. In certain cases of fractured patella we get excellent results without operation. Those are cases in which the fascia is not widely torn, where the fragments are not separated. It is not the fracture of the patella so much as tearing of the fascia which causes trouble, and if we have only slight separation of fragments either of the patella, which is only a sesamoid bone in the course of the tendon, or the tendon itself, mechanical means will be able to give good functional results.

Dr. H. Warren White, of Roxbury: This paper is very interesting to me just now, after having taken care of a case similar in many ways. A man of seventy in going down steps thought there was another step. He made an attempted step and recovered himself, but felt, as he described it, as if he "had torn his pants." There was a giving way of something, he looked down and found he could not manipulate his leg, could not extend it at all. He was completely incapacitated and brought home and treated with plaster-of-Paris bandages. But the curious part of our case was, that at the end of ten weeks, after re-

moval of the plaster-of-Paris bandage and what appeared to be a complete and satisfactory result, and wearing an ordinary rubber bandage, he was in the stable attending to some duties when with a slippery floor under him his foot gave way suddenly and the same accident happened again, absolutely the same as far as the gap was concerned; perhaps not quite as extensive, that is, the gap was not quite so wide as at the first time, but there was the same inability to extend the leg. He is at the present time lying in bed with a plaster-of-Paris bandage on and we are hoping of course for as good a union as before. I had a consultation in this case and the same conclusion against operation was arrived at, that Dr. Stetson speaks of. Our patient was old. He also had urinary trouble and there was the slight arterio-sclerosis of which he speaks, and signs of the same muscular weakening or degeneration which probably permits such an accident to occur in these cases.

ARTICLE XXV.

THE PRESENT STATUS OF THE SURGERY OF THE PROSTATE GLAND.

By PAUL THORNDIKE, M.D.
OF BOSTON.

READ JUNE 9, 1903.

THE PRESENT STATUS OF THE SURGERY OF THE PROSTATE GLAND.

THE reader has been asked to give a short résumé of the present condition of prostatic surgery. It becomes evident at once that to do this in the fifteen minutes' time allotted for the purpose, makes a detailed account of technical procedures quite impossible, and little more can be attempted than to mention briefly the various steps which have brought prostatic surgery where it is to-day, and to consider with equal brevity the class of cases best adapted to each of the operative procedures which are in use at the present time. If this paper serves to help the practitioner of medicine to formulate and arrange his ideas as to the treatment of cases of obstructive enlargement of the prostate which are so common in every physician's practice, its object will have been attained.

Bottini performed his first cautery operation over thirty years ago and continued the use of his instrument up to the time of his very recent death, but the operation never gained an extensive repute until within the last few years. Belfield of Chicago performed the first prostatectomy in 1885, but it was not until the publication of a series of cases of prostatectomy, by McGill of Leeds in 1888, and the communication of Mr. McGill and his colleagues of the Leeds Infirmary, at the meeting of the British Medical Association in 1889, that the surgical world realized the practicability of a radical operation for the removal of obstructing prostatic masses.

Even during the last fifteen years hypertrophy of the prostate gland has been a condition to palliate and not to cure in the hands of most surgeons and the men who have added radical operations upon the prostate to their list of routine procedures have been few indeed. How is all this changed! Almost every surgeon has done his few prostatectomies and has his own ideas regarding the Bottini operation, even if he has not had actual experience in the performance of it. The surgical literature of the last two years amply demonstrates the fact that the surgery of the prostate is one of the burning topics of the moment and shows that the surgeon who contents himself with guiding all the patients who come to him for relief from this obstruction, through years of more or less painful and dangerous catheter life without offering them the relief which a prostatectomy or a galvano-cautery operation has to offer, is often indeed remiss in his duty.

In the earlier prostatectomies the organ was approached through a supra-pubic incision into the bladder, and its removal was attempted piecemeal by instruments made for the purpose. The operation was a prolonged and bloody one, and no surgeon acquired large experience in its performance. Its mortality was something like 15 per cent. and it was looked upon with enough dread by the profession at large, to lead them to resort to a variety of other procedures of a less severe kind, all aiming at palliation without attempting the actual removal of the obstructing portions of the gland. Supra-pubic drainage, both temporary and permanent, incisions into and removals of portions of the gland through the urethra or through supra-pubic or perineal incisions, castration, ligation of the vasa deferentia without castration, the galvano-cautery operation of Bottini and its modifications as instituted by Young of Baltimore and Chetwood of New York (the latter of whom performs the cauterization through a perineal incision with an

instrument devised by himself) all will serve as examples of such procedures. Many of these palliative operations were so unsuccessful and others were so uncertain in their benefits that when it was realized that obstructing prostatic masses can be quickly and easily enucleated by the finger through a supra-pubic incision, prostatectomy began to assume a real place in technical surgery, and a good many men acquired a considerable experience and skill with this supra-pubic enucleation. In 1895 Nicoll of Glasgow, and in 1896 Alexander of New York with a slightly different technique, demonstrated series of cases to show, what Zuckerkandl in Vienna and Watson of Boston (1888) had pointed out as possible years before, that the prostate could be approached through a perineal incision. And as you all know the perineal operation has become of late the one of choice in the minds of many surgeons. This fact has led to a very rapid improvement in the technique of the operation, an improvement which has been especially noticeable during the last year or two. Nicoll's perineal operation approached the prostate by a careful dissection between the urethra and rectum and opened the prostatic capsule from behind, thus making the operation a long, and technically a difficult one. Alexander, while approaching the gland through a median perineal incision which opens the urethra but gives a quick and easy access to the organ, felt obliged to make a preliminary supra-pubic cut into the bladder in order to push down the prostate from above into the perineal wound with a finger in the bladder. This involves two cuts instead of one and the serious complication of opening the bladder with the risks of supra-pubic asepsis attendant upon that procedure. Guiteras endeavored to avoid this complication by making the supra-pubic incision only into the prevesical space (and not into the bladder cavity) pushing down the prostate from these by introducing a finger between the bladder and symphysis pubis. At this time it

became very evident that the future improvement in the technique of the perineal operation depended upon the omission of the supra-pubic cut, and the accomplishment of the entire operation through the perineal incision. At the same time the difficulty of reaching the prostate though a perineal wound without making large and extensive dissections, became so apparent that various instruments were constructed to serve as tractors to pull down the prostate into the perineal wound where it would be more easily accessible. Guiteras of New York devised an instrument of this kind, shaped a good deal like a sponge forceps with fenestrated blades, and designed to grasp the prostatic tissue through an opening in the prostatic capsule made for the purpose of enucleation through it. Syms of New York made an ingenious tractor of a different sort, which consisted of a rubber bulb on the end of a strong rubber tube. This bulb was passed into the bladder through the perineal wound and then inflated with air so that traction upon it served to bring the prostate down within easy reach. Ferguson of Chicago has devised retractors which he inserts into an incision into the posterior aspect of the prostatic capsule through a perineal wound and so drags the prostate down within reach by traction upon its capsule and without passing any traction instrument into the bladder. Murphy of Chicago has devised similar tractors shaped like rakes, and finally Young of Baltimore has constructed what is perhaps the best of all these tractors in the shape of a steel instrument with two fenestrated blades which can be readily inserted into the bladder and then opened out into a figure of eight behind the prostate. He thinks this instrument gives him firmer and better traction than he can get in any other way.

The last year or two, then, has demonstrated clearly the fact that the prostate can be readily approached through a perineal incision, and can be as readily brought within the

reach of the surgeon without the necessity of a supra-pubic incision. And now comes from Young of Baltimore the last development of the technique of the perineal operation. This consists in bringing the postate well into reach and sight by traction made with his tractor just mentioned, and then removing the bulk of the obstructing glandular tissue through two lateral incisions in the prostatic capsule, leaving an intact urethra and also a narrow median zone of tissue just above the urethra, and containing the ducts from the seminal vesicles. So this operation aims to be a conservative procedure which leaves the generative powers of the individual unimpaired. This operation was described by Young at the last meeting of the American Association of Genito-Urinary Surgeons, held at Washington last month, but his paper has not yet been published. He has operated upon several cases recently and believes that he has succeeded in saving the generative apparatus unimpaired in a number of these cases.

During these years of the development of prostatectomy there have been always so many cases demanding relief, which the catheter could not give, and yet cases, which were obviously too infirm to be fit subjects for any severe surgical procedure such as is prostatectomy, that the need of other less severe and perhaps also less radical measures has been almost as great as ever. This need was accentuated by the fact that castration failed to give the permanent relief to such cases which was claimed and expected from it, and also proved, as clearly shown by Cabot in his report to the American Surgical Association, to be almost as dangerous as the more radical operations attacking the prostate itself. These conditions led many surgeons to turn back to the Bottini operation, which now for the first time is having a wide-spread trial. It is proving so satisfactory as a palliative operation and its attendant risks are so much less than those which prostatectomy offers, that when it

became certain that this operation can be performed when necessary without the aid of a general anæsthetic, it was small wonder that it acquired so many adherents. The operation consists, as you know, in burning grooves through the obstructing portions of the prostate by means of a galvano-cautery constructed for the purpose. It has always been claimed by the believers in prostatectomy, that the Bottini operation is too uncertain in its results, and that it was often performed in the dark and for conditions of which too little accurate information could be obtained, to be safe for general use; that if, on the one hand, the cauterizing blade be too superficially used, the results are bad, while if, on the other hand, they are made deeper, there is great danger of burning through into the periprostatic tissues and rectum. The reader has always shared these beliefs, and has never until recently employed this procedure, but when Young of Baltimore obviated this uncertainty of operation to a large extent by modifying the instrument in such a way as to provide different sized blades for different sized prostates, the accuracy of the operation was greatly increased, and now the reader believes firmly that, with the knowledge which can be obtained by examination, and measurements with urethral instruments, by palpation (supra pubic and rectal), and by the cystoscope, which, when its use is feasible, will always give a fair idea of the conditions at the bladder outlet, the Bottini operation, as modified by Young's instrument, is sufficiently accurate to be safe in the hands of those familiar with its use, that it is applicable to perhaps a larger class of cases than any other single operative procedure, and that it can be performed without the use of an anæsthetic other than cocaine should the necessities of the case require it. The reader's own cases are too few in number to be worthy of tabulation, but they have encouraged him in his belief in the operation, and it is his hope to report before long a series of such cases to this Society.

Now let us consider very briefly the class of cases in which these different procedures, both palliative and operative, are to be advocated.

Catheter. — The systematic use of the catheter has always been the chief means of palliating cases of prostatic obstruction. There are as many, or more, cases to-day as ever when such palliation is possible and is to be advocated. Many of these go on throughout their lives in comparative comfort, and the danger from such a catheter life comes not during its proper continuance but through the hopeful efforts to continue it after its proper sphere of usefulness is past. Just at the moment when this becomes true, when, either through a lack of intelligence or a lack of proper surroundings on the part of the patient, or by reason of mechanical difficulties which prevent the easy and systematic use of the instrument such a catheter life becomes no longer easily feasible, then is the time for operative interference. The reader has operated in a few instances upon patients without advocating a catheter life at all, because in these individual cases, even though relief was sought early in the development of symptoms, the difficulties in the way of a proper catheter life were so manifest and so apparently insurmountable.

Prostatectomy. — A year ago the reader stated at a meeting in this hall that prostatectomy was *always* the choice for all cases which could no longer be palliated, and which were fair subjects for operation. This statement holds good to-day, and is based upon the fact that this operation is the only one which offers a cure for the condition with any considerable degree of certainty. It is, however, by no means proper to offer prostatectomy to all patients who have passed the stage of possible palliation, so long as other less dangerous expedients are at our command. Prostatectomy is an operation of considerable severity, and, when performed upon men past the prime of life, will always

be attended with danger to life, no matter what improvements in its technique have taken or still may take place. Therefore, although its results are surest, it is adapted only to cases which are fair surgical risks, that is to patients with fair heart and arteries, fair kidneys, and a bladder which can be made clean and kept so. These conditions are not often present in patients over sixty to sixty-five years of age.

As to which operation shall be performed in cases where a prostatectomy has been decided upon, this may be said: In spite of the great technical improvements which have lately been made in the perineal operation, improvements which have made the operation easier, and more accurate of performance, and correspondingly less severe upon the patient, there is still a place for the supra pubic operation. This procedure offers and always will offer, as its great advantage, a visual inspection of the parts about to be attacked, which cannot be obtained in any other way. The cases especially adapted to its use are those of great enlargement, which involve the removal of enormous masses of glandular tissue. Such masses are always within easy reach of the enucleating finger, and their removal drops the bladder outlet, so that good drainage can usually be obtained through a catheter tied into the bladder through the urethra, and a perineal incision for drainage can usually be dispensed with. The disadvantages of the operation are a slightly longer convalescence, the possibility of sepsis in the supra pubic and prevesical tissues, and occasionally a tendency to hernial protrusion through the supra pubic scar. Up to the present time it has always proved a shorter, less severe and less dangerous operation in the reader's hands than the perineal operation; but the constantly improving technique of the latter and its ever increasing ease and accuracy of performance will probably change all that. The perineal operation should probably be done in most cases when a

good idea of the existing conditions to be attacked can be had prior to operation, and especially when a successful use of the cystoscope has rendered the intra vesical conditions a known quantity. Now that the perineal route is developing conservative possibilities, and also is making the operation less traumatic and more accurate in character, it will become the operation of choice for most cases in the hands of the average surgeon.

The Bottini Operation stands proven beyond dispute a less dangerous procedure than prostatectomy, and as it can always be performed without a general anæsthetic, and as it has a very short period of convalescence, the reasons for this fact can be readily understood. Its results, though not so certain as those of prostatectomy, are sufficiently good to gain for it a constantly increasing confidence, and the reader believes that this procedure should be offered to all cases which can no longer be made comfortable by palliative means, and which are too infirm to make the risks of prostatectomy justifiable. Such cases will be found to comprise a very large percentage of all prostatics who present themselves to the surgeon for relief, and they are probably greater in number than any other one class of cases. The instrument as modified by Young unquestionably increases the accuracy of the cauterization and is, in the reader's belief, the best one to use.

Résumé. — To conclude, then, we may say:

1. That no prostatic should be allowed to suffer for lack of proper treatment.

2. That there is still a place for the catheter in such treatment, and that many patients can be made comfortable and can be kept so, by its systematic and proper use.

3. That all those patients who cannot be kept comfortable by palliative means are fit subjects for some operation.

4. That the time for such an operation is just as soon as the inadequacy of palliative treatment is demonstrated.

5. That the operation of choice is always prostatectomy, but that this operation can be properly offered to those patients only whose general conditions make them fair surgical risks, and that such is rarely the case after sixty to sixty-five years of age.

6. That to all other patients the Bottini operation can be fairly offered as one attended with little risk to life, a short convalescence, and a good prospect of such a degree of improvement as will at least do away with any further necessity for the systematic use of the catheter.

DISCUSSION.

Dr. F. S. Watson, of Boston: I can add very little I think, if anything, to what Dr. Thorndike has said. I want to join most heartily in commendation of Dr. Thorndike's paper. It seems to me that it very fully covers the ground and is admirably well balanced, and weighs the value of different proceedings in very just light. Practically all that I can do is to emphasize some few points already spoken of. The most essential point is that of the selection of the patients for whom the prostatic operations are desirable and of applying the method best suited to each individual case. There is no hard and fast line to be drawn in this respect according to the patient's age. The question turns upon the condition of the kidneys, and in this respect some men of seventy-five are quite as young as others of fifty-five.

We are better able to estimate the condition of the renal function, owing to the introduction of some of the recent methods such as cryoscopy, and the phloridzin test, etc., than we were formerly. But even without their aid, the renal capability of sustaining the shock of such operations as are the radical ones upon the prostate, was sufficiently well shown by the usual methods of urinary analysis, and especially by one of its features which is peculiarly significant in these particular cases. I mean the specific gravity of the urine. If this is found to be constantly low—1012

or so—radical measures upon the prostate are fairly sure to be followed by serious or fatal consequences. The large majority of these patients die after operations of that sort from renal insufficiency; sepsis and other conditions playing but a relatively unimportant role in this respect.

But even in the absence of such danger signals all precautions should be taken against the occurrence of these fatal or alarming states in connection with operative procedures, and something may be done to avert them.

There is little that can be done with respect to guarding against the dangers arising from renal insufficiency. A suggestion made by Dr. MacGowan of California seems well worth following. He says that his dread of renal insufficiency in connection with operations upon the urinary organs has been greatly lessened owing to the employment of abundant subcutaneous injection of saline solution, which he employs as a routine measure at the beginning of every such operation, and which he credits with the power to avert subsequent failure of the renal function. Other than this and the usual precautions, such as guarding the patient from exposure to cold etc., there is little to be done to ward off the danger from the defective renal action.

The risk from sepsis is very much less than from the other element just referred to, and more may be done to minimize it.

The most important thing to be done in this connection is, of course, to reduce—to cure is rarely possible—the cystitis if present, beforehand, and to keep the bladder and operative field clean subsequently. The agents which I have found most useful for the former object, have been urotropin, and for local application solutions of methylene blue, and argyrol as bladder irrigations.

The most essential point in connection with these prostatic operations is the proper selection of the time at which to perform them. The longer my experience of these cases the more do I incline toward early operation, and the greater my disinclination to postpone surgical intervention until the use of the catheter has become inadequate.

When the latter point has been reached, the patient is already in a condition unfavorable for operation, and it will be performed in the face of dangers which, had it been done prior to this time, would not have been incurred, or at any

rate, when they would have been very much less. In fact the risk attending the performance of Bottini's operation in the early stages of this disease is very little indeed, and one which I am confident I shall incline to advise patients to assume more frequently and at an earlier stage of the malady in the future, than has been my custom in the past.

My position as to the choice of methods is practically the same as expressed by Dr. Thorndike.

The performance of the perineal enucleation of the gland is, in cases in which it is appropriate, usually very easy. The essential factors in the readiness with which it is done, are fixation of the gland, and the bringing of it as far down as possible onto the perineum. These may be secured by downward pressure from above the symphysis by the hand of an assistant upon the empty bladder, and by drawing it in the same direction by the tips of two fingers resting upon its upper border in the rectum, or probably better by means of such an instrument as that of Dr. Young, which Dr. Thorndike has just shown. I have not used the latter, and am therefore unable to speak more postively of it.

It is remarkable how easy the perineal operation may be in some cases—in one case I removed the whole gland in four minutes—and how difficult in others.

The choice of methods seems to me to be easily divided. In cases in which the cystoscope has shown it to be appropriate and adequate, the Bottini operation, though my personal experience with it is limited, is, upon the evidence in our possession, that of choice. In other cases the best plan to follow is, I believe, as I have frequently stated before, to open the perineal urethra by the usual incision, explore the condition of the gland with the finger, and then to remove it or its obstructing portions through the perineal incision when that is feasible, and when it is not to proceed at once to the suprapubic operation.

One word with regard to the use of the cystoscope in these cases. It has one undoubted and great value, which is that it is capable of determining beforehand as a rule, whether the case is appropriate for a Bottini operation or not, although it is possible to be misled even in this respect because of the inability to gauge the extent of the parts of the gland, and the degree of obstruction for which they may be responsible, which are not visible from within the bladder.

ARTICLE XXVI.

A BRIEF SUMMARY OF THE SURGERY OF THE ŒSOPHAGUS.

By SAMUEL J. MIXTER, M.D.
OF BOSTON.

READ JUNE 9, 1903.

A BRIEF SUMMARY OF THE SURGERY OF THE ŒSOPHAGUS.

THROUGHOUT a considerable part of its course, the œsophagus is more difficult of access than any other part of the alimentary canal, and hence the surgical procedures resorted to in other situations for the relief and cure of malignant and other growths, are not available here. In the neck, however, its upper part is easily reached, and through the stomach something may be done to its lower part.

The chief causes calling for surgical interference are, —

1. Congenital malformations, such as double œsophagus or pouches.
2. Impacted foreign bodies.
3. Malignant disease.
4. Syphilis.
5. Cicatricial stricture.

In the above list is not included spasm of the œsophagus, really a medical rather than a surgical condition, although it is almost always cured by mechanical means, the passage of a full sized probang. It should be mentioned, however, that Mickulicz, in a paper read before the American Surgical Association at its recent meeting in Washington, describes an exaggerated form which he calls "Cardiospasm," causing a very considerable fusiform dilatation of the lower part of the œsophagus, for which he has performed gastrotomy, and through the opening forcibly dilated the cardiac orifice. He also suggests that this might be done by means of a suitable dilator, introduced from above.

1. Congenital malformations are perhaps the most interesting and puzzling conditions met with. They may exist for years, and only suddenly be called to the attention of the patient by an inability to swallow, caused by some irritation produced by a rough, ingested body, or they may be the cause of difficulty for years, and simply give the patient great discomfort and annoyance without endangering his life.

The case of a boy of ten years of age in my service at the Massachusetts General Hospital well illustrates an exaggerated form of this condition. He was brought in in the last stages of starvation, having had difficulty in swallowing for some years, the trouble being thought due to a small metal disc that he had swallowed when about four years old. He died soon after a gastrostomy had been performed under cocoaine anæsthesia, and on autopsy it was found that there were two tubes, one reaching from the pharynx nearly to the stomach, the other from the stomach nearly to the pharynx, with only a very small opening between them about three inches from the stomach.

Such a case might, I am sure, have been relieved, if not cured, in the manner to be spoken of later in connection with cicatricial contraction.

Congenital pouches are much more common, I have found, than is generally supposed. I have seen a considerable number of them, having seen three of them in my office in a month. They are usually small at first, and it is often late in life when they cause serious inconvenience. In these cases there is usually a history of a "small throat" since childhood, and finally regurgitation of food. These pouches are found in all parts of the œsophagus, but fortunately are most often situated in the neck or behind the clavicles.

When the pouch becomes dilated it is almost impossible for the patient to swallow enough food of any kind to keep

himself alive, though there is really no true stricture of the canal, the whole trouble being caused by the "spur" that acts as a valve.

When the pouch can be reached it may be excised and the œsophagus sutured, the result being a perfect restoration of function. This is the ideal method of treatment and should always be advised if the patient's age is suitable.

Much to my surprise, I have found that in many cases, when, for one reason or another, it was not thought best to resort to what must always be a difficult and fairly dangerous operation, I could by the passage of suitable bougies relieve the difficulty to a considerable degree, and the pouch would contract to a remarkable extent, so that the most distressing symptoms would disappear. The patient is given a large bougie which he learns to pass himself, and, though not cured, is made comfortable. This method of palliative treatment is worthy of trial in certain cases.

The passage of a bougie past such a pouch is not the easiest thing in the world, even to the practised hand, as the opening of the œsophagus is always on one side, and though large enough to admit an instrument of the largest size, may not be found by the tip of the bougie until after repeated trials.

And just here let me speak of œsophageal bougies and their passage. Unfortunately in this country I have been unable to find a good quality or suitable sizes. The most perfect ones that I have seen come from Paris, are woven like urethral bougies with olive tip, beautifully polished, and some of them are loaded with fine shot. The largest sizes should be at least three-fourths of an inch in diameter.

As has been said before, the lower opening is almost always on one side of the canal, and this is true not only of the congenital pouch but also of the acquired pouch that usually forms above malignant and cicatricial strictures.

Hence, in order to find this opening it is well to have a bougie bent at a slight angle or even of a bayonet shape, so that the point will hug the side of the canal. This may be best done by a whalebone stylet, bent at the proper angle by heat, and forced down into the hollow bougie. It should always be remembered that even with these flexible instruments, fatal injury may be inflicted, not only by passing them through a malignant growth into the mediastinum or elsewhere, or through the bottom of a congenital or acquired pouch, but also through the normal wall of the pharynx or œsophagus. I have had one such accident, perforating the wall just at the beginning of the œsophagus, when every attempt to swallow, forced air and the contents of the pharynx into the cellular tissue, causing emphysema, inflammation and death.

The bulb probang is a useful instrument for exploration and diagnosis, but is not to be recommended for dilatation.

2. Of impacted foreign bodies so much has been written that one need only speak of the great advantages of œsophagotomy or gastrotomy in their removal, over prolonged or violent attempts with forceps, coin catchers and similar instruments.

In the hands of the expert laryngologist, the removal of foreign bodies from the œsophagus by means of suitably constructed œsophageal tubes or specula and forceps, is often most successful, and should always be tried if the right man and instruments are at hand.

3. Malignant disease of the œsophagus is the most frequent cause for seeking surgical aid, and the one most hopeless of cure, though much may be done to avert starvation and to relieve the patient. It may occur in any part of the canal and is seldom of such character that excision is of benefit. Sometimes, however, when the growth is very high up, it may be possible to remove it and bring the lower end of

the œsophagus into the lower angle of the wound. As a rule we must be satisfied with relieving the dysphagia.

Dilating the stricture is the most common method of treatment and is the most satisfactory in many cases, especially if food is introduced into the stomach at the same time. In many cases there is hemorrhage or irritation caused by every introduction of the bougie, and it is in these cases that Symond's method of permanent tubage is of great help. The tube is introduced over a small bougie as a guide and is left in for a week or two, the patient swallowing liquids easily until the tube becomes foul and stopped. Remember that a pouch almost always forms above a malignant stricture and hence the passage of a straight instrument may not be possible. For impassable or very irritable strictures of this sort, œsophagostomy or gastrostomy is demanded. I have had most satisfactory results with œsophagostomy in disease high up, and much prefer it to gastrostomy when it is possible.

4. Of syphilitic strictures there is little to be said except that they are far from common and should be treated with appropriate medication and dilatation.

5. Cicatricial strictures of the œsophagus, generally the result of swallowing strong acids or more generally alkalies, are among the most common and obstinate lesions of this canal that the surgeon is called upon to treat. Generally multiple and difficult to dilate, often with several acquired pouches, the resources of the surgeon are taxed to the utmost. Constant dilatation will serve to keep the canal patent, but often the canal is tortuous and even impassable to the smallest bougie. Sometimes an instrument may be passed *upward* from the stomach through a gastrotomy opening, but it is by no means easy.

It is in these cases that the method of Abbe—sawing through the stricture with a string—is of the greatest benefit.

Two years ago, before this Society, Dunham of New

York read a paper on this subject and demonstrated his beautiful method of getting a guide through a seemingly impassable stricture. His recent paper in the Annals of Surgery gives the whole story, so it need not be repeated here; enough to say that anyone who has ever tried this method, as I have in a number of cases, cannot fail to be impressed with its ingenuity, simplicity and splendid efficiency. It is the greatest improvement in the technique of œsophageal surgery in recent years. By this method of thread swallowing I have been able to relieve most desperate and apparently hopeless cases of multiple stricture both in children and adults, and keep them from living the rest of their lives dependent on a tube and tunnel in connection with a gastrostomy opening.

In conclusion let me strongly insist upon care and delicacy of manipulation in all œsophageal work. Do not even examine too long at the first sitting if the instrument does not pass readily. Too prolonged probing may send the patient home with a stricture that is tightly closed by swelling and the result may be serious. The œsophagus is more intolerant of violence than even the urethra.

DISCUSSION.

Dr. G. W. Gay, of Boston: It has fallen to my lot to do œsophagotomy four times; once upon a child, 3½ years of age, for the removal of a cent, once for a plate carrying four teeth, once for a fish hook, and once for a malignant stricture of the œsophagus to enable a Symond's tube to be placed in position. Another case of foreign body should have been treated by operation, but owing to one of those psychical lapses to which, I presume, most of us are occasionally liable, the diagnosis was not made until the autopsy revealed a small sliver which had ulcerated through the walls of the œsophagus, and produced an abscess in the mediastinum. The first operation was done in 1878. No more cases came to my notice for thirteen years, when three operations were done within five months.

My first case of œsophagotomy was done on Sunday, Sept. 8, 1878. The patient, a cook, 49 years of age, while eating fish, felt something lodge in the throat, which prevented her from swallowing solids. She entered the City Hospital twenty-six hours after the accident, presenting the usual symptoms of these cases. She was unable to swallow solid food, and could swallow liquids only in a very small quantity, and after repeated and painful efforts. She was weak, depressed, and evidently the victim of a profound general disturbance.

The careful use of the bristle and sponge probangs failed to dislodge the foreign body. The pulse and temperature began to rise, and the constitutional disturbance, in the way of restlessness, depression and debility, increased. Forty-eight hours after the accident the œsophagus was exposed upon the left side, as described by Dr. Cheever in his classical monograph. A sharp substance was felt at the bottom of the wound, which after a little manipulation was seized with forceps and made to cut its own way through the walls of the gullet, purulent matter escaping with it. The cause of the trouble proved to be a thin, flat fish bone an inch and a quarter in length, and a third of an inch wide. It was imbedded in the posterior wall of the œsophagus opposite the cricoid cartilage. No ligatures were required. The small wound in the œsophagus was allowed to take care of itself. The external one was closed with sutures.

For four days after the operation no food or drinks were swallowed, but she received rectal injections of beef tea, etc., every four hours. The wound suppurated moderately, but no food or drink ever escaped from it. It was healed in ten days, and the patient left the hospital eighteen days after operation. She was able to eat solid food, and was apparently as well as ever.

This was a fortunate case in that the operation was done earlier than usual, forty-eight hours after the accident, the foreign body was located favorably for removal, and comparatively little violence to the deeper structures was necessary.

Lena, three and half years old, was brought to the City Hospital on Friday, October 16, 1891, with a history of

having swallowed a foreign substance eight months before. She was said to have had little, if any, trouble for six months; but for the past two months she had ejected most of her food in about a minute after it was swallowed. She was weak, languid, emaciated, and presented all the appearance of a sick child.

She was examined under chloroform with an ivory-tipped probang, and a metallic body readily detected in the lower part of the œsophagus. The gullet was opened in the usual manner, the walls being divided upon a uterine sound as a guide. The foreign body was located about two inches below the top of the sternum, and four inches from the opening in the œsophagus. It was readily removed with a pair of bullet forceps, and proved to be an ordinary copper cent.

The wound was left open, and the child was nourished for some days on enemata of peptonized milk. From the first she was allowed to drink all the cold water she wanted, as the thirst was irresistable. Liquids escaped from the wound in diminishing quantities for ten days. The child was up and around the ward in thirteen days, and was discharged two days later. Twenty-five days after operation she was eating solids, had regained her flesh and strength, and was well.

A teamster, a young man of intemperate habits, fell from his cart and knocked a plate with four false teeth down his throat. He entered the hospital four days later in a wretched condition. He could swallow only liquids, and these in very small quantity, and with great difficulty. He was septic, weak, despondent and miserable.

With an ivory-tipped probang the plate was easily detected in the œsophagus, thirteen inches from the upper incisors, and about four inches below the top of the sternum. There was moderate swelling above the clavicles and sternum.

Œsophagotomy was done at once, the walls of the tube being divided upon a pair of œsophageal forceps used as a guide. The plate was located about seven inches from the wound, and after careful manipulation was finally removed with forceps. Its measurements were one and three-quarters by one and a half inches, with the usual sharp corners, and prominent borders.

The wound was closed, and the patient fed and stimulated by the rectum and through a stomach tube. In spite of vigorous measures along these lines, he died of sepsis five days after the operation.

Mr. K., aged forty-eight years, entered the City Hospital suffering from a malignant stricture of the œsophagus, which prevented his swallowing anything whatever. The dysphagia had been growing markedly worse for about four months. As might be expected he was weak and emaciated, and suffering all the horrors of slow starvation. All instruments passed into the gullet brought up in a pouch behind the sternum. To enable a bougie to be passed through the stricture into the stomach, the œsophagus was opened in the usual place and manner, and with a finger in the wound a hard mass, the size of a hen's egg, was readily felt involving the gullet. Above this mass the œsophagus was dilated into a sac. On the anterior wall about an inch from the bottom was found the opening of the lower portion of the gullet leading to the stomach. A long bougie was passed through the mouth, and guided by the finger in the wound, was made to enter the lower part of the tube. This done, Dr. Mixter had no difficulty in placing the No. 19 Symond's tube in position, so that it passed through the stricture into the stomach.

The patient rallied well from the chloroform, and was able to drink liquids fairly well. While considerable quantities escaped from the wound, yet he retained enough to remove his hunger and thirst, and enable him to gain quite a little strength, sufficient to make him much more comfortable than he was before the operation. The tube was replaced by another in two weeks, and again nine days later. As this last one could not be removed by any reasonable force, it was allowed to remain during the remainder of his life.

This patient improved sufficiently to enable him to go home a month after the operation, where he remained until two days before his death. He entered the hospital for the last time, emaciated to the last degree, and suffering horribly from dyspnœa. A quick tracheotomy was done under a few whiffs of chloroform with some little relief, but he

soon succumbed to the disease and died in forty-eight hours.

Could this patient's œsophagus have been intubed earlier, it is but fair to conclude, from the relief he did get, and from the experience of Dr. Mixter and others, that he might have lived some time longer, and that he certainly would have suffered less than he did. In the earlier stages of the disease, before the œsophagus had become dilated above the growth, the Symond's tube could probably have been inserted without any operation. This disease is always fatal so far as we know, and yet almost any measures are justifiable to give even temporary relief to the horrible suffering of slow starvation.

The diagnosis of foreign bodies in the œsophagus is not difficult for those who have ever seen a case of this sort. Many physicians, however, have never met with the accident, and therefore might find it anything but easy to distinguish the real from the suspected cases. The latter are more common than the former, and usually occur in nervous or neurotic persons, as servant girls, etc. They complain of pain and difficulty in swallowing, and yet they can readily swallow liquids, or even solids, without any great effort. They are apt to be indefinite as to the exact location of the sore spot, it being situated in different places at different times, or more commonly the distress is a general soreness, rather than a distinct, localized, painful spot. There is no constitutional disturbance whatever, no increase in pulse or temperature, and no depression of the vital energies. They are nervous and frightened, but not sick.

Now the clinical picture of a person with a foreign body lodged in the œsophagus is very different from all this, and once seen can never be forgotten. Depressed, anxious, debilitated from the lack of nourishment, dreading to make the effort of swallowing, and accomplishing that function only with great difficulty and after repeated trials, locating the tender or painful point definitely, and always in the same place:—these symptoms point very strongly to the pressure of a foreign body in the gullet. The diagnosis is complete if it can be confirmed by an examination with an ivory-tipped bougie, or similar instrument. Unfortunately many foreign substances elude the peculiar impact of the

bougie, and thus little or no aid is to be obtained in that manner. The above symptoms, however, if severe and progressive, justify an exploratory operation.

The X-ray furnishes unmistakable evidence of the presence of certain substances in this part of the body, as well as in every other. False teeth, pins, needles and other metals are readily shown by these rays, and thus give us the benefit of a positive diagnosis.

Little dependence can be placed upon bristle and other probangs for the removal of foreign bodies from the gullet. They sometimes succeed, but oftener fail in accomplishing the object. I once removed a large piece of turkey bone and meat with the bristle probang, twenty-four hours after its introduction. In a case of a child three and a half years old, a careful examination under chloroform failed to reveal any foreign body, although the symptoms pointed strongly to its presence. Operation was refused. Eight months after the supposed accident the boy vomited a pewter quarter of a dollar. All symptoms, including a persistent hoarseness, soon after disappeared, and the boy was perfectly well.

In regard to the method of doing œsophagotomy the only point that I would call especial attention to is the use of some metallic guide in the œsophagus. The great advantage of this sort of an instrument over a flexible one is that it can be more readily introduced, can be manipulated and controlled at will, and hence made prominent at place of incision of the œsophageal walls. We have found the ordinary uterine sound to answer the purpose very well, especially in children, but anything having the necessary curves and stiffness will do.

In a thin neck, free from œdema or swelling, the operation for opening the œsophagus is not a difficult one, but under opposite conditions it may be very difficult. Hemorrhage usually gives little or no trouble, and often no ligatures are required. As a rule the writer has used chloroform in operations upon the œsophagus, as well as in those involving the trachea, for the purpose of avoiding the spasm of the glottis, and free accretion of mucus which at times threatens to drown the patient. Less danger is to be apprehended from these complications in operations upon

the œsophagus, than upon the trachea in which they are common and call for close watching and prompt relief to avoid disastrous results. The risks in the use of chloroform under these circumstances are probably less than are to be expected from the various complications that may arise under ether. The writer has never met with any trouble or untoward symptoms from the use of chloroform in operations about the face and neck, while he is fully aware of the moderate danger of its use in general surgical operations.

ARTICLE XXVII.

CANCER OF THE INTESTINE.

By HOMER GAGE, M.D.
OF WORCESTER.

READ JUNE 9, 1903.

CANCER OF THE INTESTINE; ITS SURGICAL ASPECT, WITH REPORT OF CASES.

THE danger of septic infection was one of the most important, if not the controlling factor in limiting the field within which surgical operations could be properly undertaken a generation ago. Its removal by the development of an aseptic technique marks the beginning of a new surgery, one of whose first impulses seems to have been to see how much mutilation and interference nature will permit. Life is found to be quite livable without many of the organs that had hitherto been supposed to be essential to its existance.

But now that the possibility of these radical excisions and resections is established, must come the second stage in the new surgery, viz.—a careful study of the remote, as well as the immediate results of these new operations.

It seems quite certain that we shall discover that much that is possible, is attended with very grave dangers to life, and is followed by an impairment of comfort and health, that makes the life that is left hardly worth living. Already strong protests are being made by our medical brothers against many of the more radical operations—protests that must be heard and if possible answered, for after all our purpose must be, not to see what surgical feats can be successfully accomplished, but how they can be made to contribute to the prolongation of life, and the relief of suffering.

One of the most notable protests that has been made recently, was contained in the Anniversary Discourse before the New York Academy of Medicine, delivered December 5, 1901, by Dr. Reginald H. Fitz of Boston.

It is an exceedingly temperate and judicial review of the ultimate results of surgical interferenee with diseased conditions, that had hitherto been regarded as incurable. Much of it is naturally taken up with a consideration of the surgery of internal cancer, and it is to one feature of this, that I wish to call your attention for a few moments.

In the records of the Massachusetts General Hospital for the ten years from 1890 to 1900 he found, "10 cases of intestinal resection for cancer, of which, 8 died within a month after the operation; the 9th patient was found to have a girdling ulcer without gross evidence of malignant disease, although from microscopical examination, regarded as an adeno-carcinoma. He was at work as janitor and enjoying fair health two and a half years after operation. The 10th patient was not heard from. Of the five cases of intestinal anastomosis (for cancer) two died within the fortnight following operation; one lived 6 months, and 2 have not been heard from." "Of the 77 cases of cancer of the alimentary canal two, or only 3%, were living at the end of three years after the operation."

If we consider the question of relief of suffering in those whose history subsequent to the operation could be learned, the result is equally disappointing. I have thought it would be worth while therefore, to look very briefly at the results which have been obtained by others in the surgical treatment of intestinal cancer, and to add my own small, but to me, significant experience.

In the first place, one finds it quite unsatisfactory to depend overmuch upon a general compilation of reported cases. The immediate results are so much better than the full reports from the more important clinics, that one feels

at once that the tendency to report individual successes, makes the general table relatively unreliable as a true index of the general mortality, and further, most of the cases are reported too early to give any assurance of the success or failure of the operation. Lardennois collected 241 cases with 24 deaths, a mortality of 34.8% and Bovis 171 cases, with a mortality of 31.5%. Contrast this with the combined experience of such operators as Krönlein, Korte, Czerny, Billroth-Salzer and König, whose 58 cases resulted in 28 deaths, a mortality of 48.4%; of these Kortes' record of 19 cases with 7 deaths, or 36.8% is the best—all of the others having a mortality of 50% or over. At St. Thomas' Hospital between 1888 and 1897, there were 12 resections with 7 deaths, and Von Bramanns in 1897 reported 14 cases with 6 deaths.

According to Korte, the cæcum is the most favorable locality for operative interference, he having resected for carcinoma 5 times, and sarcoma once, with no deaths. This view is further supported by Macewen, who reports 5 cases with one death; and by Goullioud who had 6 enterectomies for cancer of the cæcum, with but one death—Krönlein, however, had 6 cases, with 3 deaths. It follows that the general mortality in intestinal resection for malignant disease, is still very high—almost 50%—except possibly in the region of the ileo-cæcal valve. So much for the immediate, now let us look for a moment at the later results.

Of Kortes' 12 successful cases, 5 were well from 3 to 8½ years after operation: 3 of his cases of resection of cæcum being alive 8½, 6¼ years respectively. Two of McEwen's cases were alive more, and two less than 3 years after operation. One of Goullioud's patients was alive 3 years, the others less than one year, while Kronlein had 5 cases in which there had been no recurrence at the end of from 5 months to 14 years. Of Von Bramanns'

cases, 4 had remained well for more than 3 years, and 3 for less.

Taking the experience of these operators, all of whose reports seem very complete, there were 56 cases of which 13 or 23% had survived the 3-year limit, without any evidence of returning disease. These figures are, it seems to me, distinctly encouraging, and do much to overcome the prejudice naturally evoked by the very unfavorable statistics quoted by Dr. Fitz.

It must be remembered that the field is comparatively new, that the diagnosis is not usually made until the disease is pretty well advanced, and that a considerable accumulation of experience must be made to furnish a basis for selection of cases, suitable for operation. In view of the experiences already quoted, it seems reasonable to assume that when the growth has not extended beyond its original seat, and can be removed with a liberal margin of uninvaded tissue, although the immediate mortality will be large, a period of immunity from recurrences can be fairly expected in a proportion of cases, that will compare favorably with the results obtained from the removal of cancer in other organs.

My own experience consists of but four cases:

Case 1. Cancer of the small intestine; acute intestinal obstruction, without previous symptoms. Operation on tenth day. Death from shock. Male, twenty-three years old, seen in consultation with Dr. M. W. Pearson of Ware. Had typhoid fever seven years ago, and has been troubled with constipation and occasional attacks of indigestion for two or three years, a very hearty eater, strong and active up to the advent of his last illness. On March 12th he ate a large quantity of cheese, from one half to a pound, and on the following day was suddenly seized with pain in his stomach and vomiting. The pain subsided, but a continuance of the vomiting led him to consult Dr. Pearson

on the 15th. In spite of a good variety of cathartics and enemata, no movement of the bowels could be secured, and the vomiting persisted. There was no distention and but little pain. Temperature had not been above 99, and until the evening of the 24th pulse had been of good quality and about 100.

On the evening of the 24th he showed signs of exhaustion, the vomiting became stercoraceous, and the pulse rose to 130. I saw him at 2 A.M. on the 25th; he was conscious, with a pinched, anxious expression, tongue moist, extremities somewhat cold, and was very restless. The abdomen was not distended, but was somewhat tender especially to left of median line below level of umbilicus, where there was a distinct increase of muscular resistance, and where under ether a definite tumor could be easily made out.

On opening the abdomen the intestines were empty and collapsed; there was a small amount of turbid serum present, and some very recent easily separated adhesion. The lump on the left side was delivered through the incision, and found to be contained within the lumen of the gut, which on its surface showed simply signs of fresh peritonitis. The portion containing the lump was partially intussuscepted into the intestine beyond. This part was resected, and the two ends united by a double row of sutures. The patient's condition was very unsatisfactory from the beginning, and he died about three hours after the operation. The specimen was examined by Dr. F. H. Baker, who reported "that it consisted of about four inches of the small intestine, probably the lower part of jujunum. On opening, it is seen to be nearly occluded by a firm irregular lobulated polypoid growth, with a thick base and without ulcerations. The growth measures one and a half inches in width. No growth is apparent on the exterior surface of the bowel, but there was some contraction about the base

of the tumor. Microscopical sections show it to be made up of an exuberant growth of glandlike structures, irregularly lined with columnar epithelium. Many of the glands are somewhat necrotic. Between the glands there is a coarse fibrous stroma.

"The diagnosis is adeno carcinoma of the small intestine."

I have given the history of this case at some length because cancer in this locality is exceeding rare, and because its existence was so entirely unexpected. There was absolutely nothing in the young man's history that would lead anyone to suspect the real condition. It illustrates afresh the value of operating early in all cases of intestinal obstruction, and the possibility, in some cases at least, of finding a cancerous growth that has not invaded the walls of the bowels, and has no palpable secondary glands. A more perfect case for complete and thorough removal of cancer in any part of the body could not be desired. It is a strong incentive to a careful study of the conditions which should lead to earlier recognition and operation.

Case 2. Cancer of cæcum; symptoms of chronic appendicitis; resection; alive and well now, two years and eight months after operation. Miss N., thirty years old, a seamstress, had always had a spot in right side that was tender; supposed she had inherited a gastric trouble from her mother. For more than ten years had been awakened in the night by attacks of colicky pain in abdomen, and for four years these had been growing more and more frequent. There was always severe pain in the right side, and the attacks of colic would occur perhaps twice in a week, and then not for six weeks; would sometimes last several hours, and were controlled only by morphine. For two years she had noticed that the gas would collect and form a bunch in the right iliac region. She had been very constipated, but the movements had been normal in appearance. During the last year she had lost flesh, and found it difficult

to keep on with her work. She was referred to me as a case of chronic appendicitis. There was marked tenderness with a distinct mass in the cæcal region, and I acquiesced in the diagnosis.

I operated September 20th, 1900, and found the cæcum converted into a hard mass; appendix not involved, normal in appearance, and the lower end of the ilium very much dilated. There were no enlarged mesenteric glands. The cæcum was movable and not adherent to any of the adjacent structures. I excised it with a portion of the ilium as well as of the ascending colon. So much enlarged was the calibre of the small intestine, that an end to end suture with the colon was easily effected. Her recovery was uninterrupted, and except for a small ventral hernia, which is easily controlled, she has been in better health than ever, with no sign of recurrence.

Dr. Baker reports, "that the specimen consists of the last two inches of the ilium, and the first five inches of the cæcum. There is no evidence of the growth on the outside of the intestine, but involving the ilio-cæcal valve there is felt a hard contracting encircling mass. On opening the lumen, the ilio-cæcal valve is contracted so that its aperture is about the size of an ordinary lead pencil. Numerous small papillary growths project into the lumen about the ilio-cæcal valve, and several small isolated ones are seen springing from the mucosa of the cæcum, as far up as one and a half inches from the valve. Sections show the intestinal wall to be about four times its normal thickness, and to be infiltrated with an adenomatous growth. The diagnosis is adneo carcinoma."

The result in this case certainly justified the interference, and is worth making several unsuccessful efforts to attain. If we could obtain as complete immunity in even twenty per cent. of our cases, it would be as favorable a showing as we can get in some of the better established and less

opposed operations for cancer, in some of the more superficial and easily accessible parts of the body.

Case 3. Cancer of hepatic flexure; chronic intestinal obstruction; resection with artificial anus; subsequent closure; death from recurrence.

The patient was a male, fifty-two years old, who had for years been a pretty constant sufferer from intestinal indigestion and constipation. In 1898 he went to Cuba as a captain in the regular army; had while there a severe attack of dysentery, and was invalided home. For a time he seemed to be much better and stronger than he had been for many years, but during the winter of 1901–2 his old trouble returned, and he was evidently losing both flesh and strength.

About March 1st, 1902, he had a severe attack of abdominal distress, with vomiting and obstinate constipation. Flatus passed freely, and there were some small but unsatisfactory movements. During the next twelve days his condition became worse; there was severe abdominal distention, but no local pain or tenderness. He could retain very little nourishment, and as the obstruction seemed to be growing more complete, in consultation with his attending physicians, Drs. Wood and Baker of Worcester, I advised his removal to the hospital for exploratory incision.

This was done on March 13th, and I found the obstruction to be caused by an annular constriction in the neighborhood of the hepatic flexure. A hard infiltrating and contracting mass involved the whole circumference of the bowel, which was intimately adherent to the abdominal wall. There were several enlarged glands to be felt in the adjacent mesentery. I succeeded in freeing the mass and excising it with enough of the mesentery to include the glands which I had felt. The patient's condition was such that I did not feel justified in attempting a careful suture, and had to be satisfied with an artificial anus at that point. He rallied

well from the operation, was able to take and retain his nourishment, and at the end of a week was removed to his home.

Here he gained rapidly in flesh and strength and was able to be up and walk about the house. On the 25th of April, six weeks after the first operation, I attempted to close the fistula and found the disease was already returning in the mesentery and adjacent parts. Symptoms of obstruction quickly supervened, and he died on the 25th of May.

Dr. Baker reported "that the specimen consisted of about five inches of the ascending colon near the hepatic flexure. Occupying about two inches of the middle, was a firm nodular encircling contracting growth, with broken adhesions over its external surface. This growth in the interior of the intestine presents a rough polypoid surface with several small areas of ulceration. The lumen of the gut was reduced to a little less than one-half inch. Sections showed the mucosa and submucosa in places to be nearly destroyed, and the growth to be made up of an irregular shaped glandlike tissue, with the glands lined with columnar epithelioma. Some sections showed marked necrosis. The inter glandular stroma was made up of coarse fibrous tissue. Adeno-carcinoma of large intestine."

The operation in this case is fairly open to the criticism made by Dr. Fitz upon surgical interference with intestinal cancer in general. If it was reasonable to open the abdomen and to make sure that the obstruction was not something that could be easily and safely relieved, a matter perhaps it should have been possible to decide without, in view of the extent of the disease and the improbability of being able thoroughly to remove it, I think the interference should have stopped there. I shall certainly never again attempt or advise removal under similar conditions.

Case 4. Is one which I reported in the Boston Medical and Surgical Journal for December 19th, 1901. It was

that of a man seventy-five years old, who was operated on by Dr. McBurney of New York for acute intestinal obstruction. Six inches of the lower half of the sigmoid flexure was resected for carcinoma. Five years later I operated for a second obstruction, caused by internal strangulation, and found no evidence of recurrent disease. He is alive and well now, seven years after the removal of the cancer, and in his eighty-second year.

Clinically these cases illustrate three different ways in which the presence of a malignant growth in the intestinal canal may manifest itself. In two, acute intestinal obstruction was the first indication of the existence of any serious trouble. There had been absolutely nothing in either case to suggest the possibility of organic disease, and as we review the histories of intestinal cancer in the reported operations, one is surprised to find how often its development proceeds wholly unsuspected.

The diagnosis in this class, therefore, cannot be made until the abdomen has been opened, and there can be no question as to the propriety of the operation. When, as in Case 2, the accompanying symptoms are such as to suggest a chronic appendicitis, and the frequency with which cancer is found in the cæcal region makes this class relatively a large one, the desirability of surgical interference is equally clear.

The existence of the more serious lesions can seldom be made out beforehand, and fortunately the early appearance of the symptoms can lead to an early discovery of the growth by a surgical incision, and to its early removal while yet confined to its original seat, when all the conditions for success are most favorable. This explains I think in no small measure, the comparative low mortality and long immunity from recurrence, observed in cases where the disease has been confined to the region of the ilio-cæcal valve.

In that class of cases represented by the patient with chronic obstruction, there is certainly room for a very wide and honest difference of opinion. If left until the obstruction is nearly complete, the growth has too often spread by contiguity or metastasis, until its complete and thorough removal is impossible. Interference under such conditions may furnish the opportunity for the exhibition of great technical skill on the part of the surgeon, but can hardly be of any substantial benefit to the patient, and too often supplies the sort of failures which are contained in Dr. Fitz's paper, to the discredit of surgery.

Much the same can be said of those cases in which operation is undertaken only after the discovery of a palpable tumor. When the disease has reached a point where the diagnosis is only too apparent, surgery is unlikely to afford any great measure of relief, and even an exploratory incision should be undertaken very cautiously, if at all.

In these cases before the appearance of obstruction or tumor, it will usually be found that there have been for a longer or shorter time, symptoms of intestinal indigestion, abdominal pain, constipation often alternating with diarrhœa, and other intestinal disturbances which, in the light of the later developments, were their forerunners.

I believe there is a time in every case of cancer of the intestine, as of cancer in other more exposed parts of the body, when the growth is local and can be removed with reasonable probability of a very long immunity from recurrence, and it is to a study of these earlier symptoms, with a view to the recognition of this earlier stage, that we must invoke the hearty co-operation of our medical friends, for that is the appropriate time for surgical interference.

I would confine the exploratory incision, then, to those cases in which the earliest symptoms were those of acute intestinal obstruction, of appendicitis, acute or chronic, and to those cases of chronic intestinal disturbance in which

there was a clear presumption that malignant disease, if it existed, had not advanced beyond the point where its radical removal was impossible.

So, too, after exploration and the discovery of a malignant growth, I would stop there, where the disease was found to have invaded the mesentery, its lymphatics, the adjacent peritoneal surfaces by adhesions, or other organs by metastasis, to an extent to make its complete and radical removal unlikely. It happens often enough here, as elsewhere, that cancer has invaded adjacent structures even when its presence cannot be detected by sight or feeling. I would reserve the radical operation for those cases in which the disease, so far as gross appearances are concerned, can be wholly isolated and removed.

I have said little of the palliative operation of colostomy, and the various forms of intestinal anastomosis and exclusion, because I feel that if the growth cannot be removed with a fair assurance of immunity from recurrence, there can be but little relief or satisfaction in a few weeks or months of added life with the burdens of a fæcal fistula, or a more or less imperfect anastomosis. Such an existence, short and full of suffering as it so often is, may be important enough for some special purpose to make one or the other of these operations necessary or desirable.

Colostomy in particular may be necessary for the relief of acute intestinal obstruction, or under other conditions as a preliminary to resection, but in the advanced stages of the disease none of these operations can afford more than a very temporary and imperfect relief, and they belong, it seems to me, to the surgery of the mechanic, not of the Samaritan.

DISCUSSION.

Dr. F. S. Watson, of Boston: I want to say one word only with regard to that part of Dr. Gage's paper which deals with the question of making an artificial opening in the bowel as a palliative measure in inoperable cases of malignant disease of this locality. I cannot agree with either the reader or with Dr. Fitz whom he quotes with regard to this point, that it is not worth while to do colostomy under such circumstances.

Dr. Fitz gives, in the paper referred to by Dr. Gage, an entirely erroneous judgment with regard to colostomy as a measure of relief in these cases. Colostomy performed as Mayo recommends, on the same principle as that of the Ssabana Jew Frank gastrostomy in cases of cancer of the stomach, uniformly affords very great comfort to the patient, and does not simply prolong life at the expense of substituting a condition so disgusting and obnoxious to the patient and to those who care for him that it is worse than that produced by the disease left to itself.

It is true that we cannot relieve the pain which is due to the pressure of the tumor, but why we should allow the patient previous to that time, or for that matter after it is present, to support the additional suffering which arises from the distension due to obstruction, or that which proceeds from the passage of feces over an ulcerated surface, when we have the power to remove both by an operation, which, when properly done, controls the action of the bowels perfectly in the majority of cases, and removes all fecal matter from contact with the diseased area, is more than I can understand. It seems to me that it would be quite as reasonable to permit a patient to die of suffocation during diphtheria in a hopelessly fatal case, rather than to supply to him the ease furnished by a tracheotomy, and thus take that sting out of the load of distress to be sustained before death comes. I am confident that any of us who was suffering from the great pain of distention in obstructive cancerous disease of the bowel, would call pretty loudly for the relief of colostomy if he had ever seen it given to another under such conditions.

Dr. A. T. Cabot, of Boston: Dr. Gage's paper I think shows very clearly that what we need is not fewer but earlier operations; and that if our medical brethren would teach us how to discover these cases earlier, rather than point out cases which we lose because they have come to us too late, we might hope to advance in the direction of cure. We know that in these cancers at that part of the intestine which is accessible to constant examination, in the lower bowel and rectum, there is a stage during which a radical removal is a cure. I have a number of patients now well from whom I have removed adenomata, adeno-carcinomas of the lower bowel. If you could learn the existence of these growths of the higher bowel during that stage the removal would be quite as easy, even more so, because the bowel is less attached to the parts about. It seems to me the thing we must seek for is a closer observation of cases during the earlier stage of obstruction, partial, recurrent obstruction, because these patients often give a history of obstipation that amounts almost to obstruction which with castor oil passes off, and then two or three months later they cannot get movements with castor oil, and are turned over to the surgeon. I think we ought to work towards better diagnosis of the earlier stages. Whether we are going to get that by examination of the feces or how, I cannot say; but, it seems to me, it is "up to" our medical brethren to help us in that way rather than by criticising the cases which coming to us too late do not result favorably.

Dr. Gage: I am well aware that there is room for a wide and honest difference of opinion in regard to these palliative operations. In my own experience, even if immediate relief is obtained, the suffering is simply postponed, and even then the relief is very incomplete. The pain and discomfort incident to the continued pressure and extension of the disease are still very much in evidence, even if the acute obstruction is overcome.

Personally I should rather go without the operation, unless the disease could be radically removed or there was some special reason for which I wished to live a few weeks longer.

ARTICLE XXVIII.

MINOR SURGERY IN COUNTRY PRACTICE.

By CLIFFORD S. CHAPIN, M.D.

OF GREAT BARRINGTON.

READ JUNE 9, 1903.

MINOR SURGERY IN COUNTRY PRACTICE.

When I was asked to write a paper to be read before the Surgical Section upon some surgical subject, I said to myself, I am not a surgeon, and what I may be able to write upon such a topic will be of little value. However, the thought came to me, how often a physician has to do minor surgical work, and with a little more care, and a little more knowledge, how much better work he could do. It is in village and country practice where a physician must be an all round man, ready for emergencies of any nature, for often there is no hospital within twenty or thirty miles to which patients can be sent. To have to do this work is certainly excellent training for any one, but more especially for the young practitioner. If we do well the minor surgery we will be more likely to work into, and do well, the major work, which may fall later to the lot of some of us to do.

I have taken up for consideration some subjects which I feel are the more important ones of minor surgery with special reference to country practice.

Bandaging. — Bandages are employed to hold dressings in contact with the surface of the body, to make pressure, to hold splints in place in dislocations and fractures, and to keep in place parts which have become displaced. The importance of being familiar with the rules of bandaging and to be proficient in applying the same can not be over-

estimated. The general practitioner will never have cause to regret time occupied in learning to apply neatly this form of surgical dressing. A well applied bandage adds to security of dressing and comfort of patient, and the manner in which it is applied often secures for the physician the confidence of patients and friends; while on the other hand, a badly applied bandage is uncomfortable, and will cause adverse criticism to the doctor. It is not necessary to know how to put on every different kind of bandage, but to be well grounded in the principles of bandaging, and to have had a reasonable experience in applying same is essential.

Asepsis and Antisepsis. — Previous to Lister's method of treatment, it was the rule in accidental and operative wounds to have suppuration, fever, pain, and often septicemia, erysipelas, etc., hence the mortality was necessarily high. Mortality from compound fractures was very great, but by modern methods it has been reduced to a minimum. Lister's method was based largely upon the idea that the infection of a wound occurred from contact with the air, which contained spores and germs, and his method was to destroy them. It was later found that the germs from the air are usually of an innocuous character. Wound infection is more often from clothing, instruments, etc., which come in contact with it. It often depends upon the quantity of germs which enter, for we know bacteria may exist in an aseptic wound. It is well known that the same germ may produce different inflammatory affections. Some one has advanced the theory that all so-called pus diseases are simply local expressions of a general infection caused by many different micro-organisms. Acute suppuration is considered clinically to be always due to presence of bacteria, and their exclusion will prevent its occurrence. Asepsis aims at thorough sterilization of the field of operation and of all objects coming in contact with the wound, and the exclusion of micro-organisms by exclusive sterilized

dressings. How important it is in all our work as physicians and surgeons to be very careful in attending to this in every detail. How much pain could be averted, how many amputations be prevented, and even major operations be saved, if only the physician who first saw the patient had simply done his duty and made the wound aseptic, and continued to keep it so. It seems to me it is just here where so many of us fail. More often nature cares for the wound successfully, but even so it is our duty to always assist her when possible.

Antisepsis, on the other hand, has in view the destruction of microörganisms by keeping germicidal agents constantly in contact with the wound. The object of antisepsis therefore is to produce asepsis. No one should undertake any operation or treat any wound without having clearly impressed upon his mind the importance of carrying out faithfully, and scientifically, all precautions necessary to prevent future infection of it. Since most wound complications are due to microörganisms in it, it is the duty of the surgeon to prevent their entrance or employ means to destroy them. This must be done, however, without injury to the tissues of the body. Asepsis is always to be preferred to antisepsis when applicable. It seems to me so necessary that all practicing physicians should be well experienced in the ways of preparing patients for aseptic operations and caring for them afterwards. Usually these operations are performed in hospitals, but sometimes have to be done at the house. The surgeon perhaps is called from a distant city and has only a short time for operating. In hospital practice suitable rooms are provided for such work; in private practice, however, the physician is called upon to select a room and give directions as to its preparation. A well lighted room should be selected, and needless furniture removed. General directions, which are usually given in text books, seem to me to be in many

cases impracticable. Often the room has to be gotten ready in too short a time to allow of removing carpets, etc., and if it is done, usually the dust created by so doing will be far greater than it would be simply to tack down upon the carpet sheets wrung out of bichloride. The great importance, in my judgment, is in paying due regard to asepsis of the wound itself. When possible prepare the patient the night before by bath, etc. The skin surrounding the site of operation should be thoroughly scrubbed with soap and water or a soup poultice applied for a few hours. Scrub the skin, not too roughly, then wash with alcohol and ether, then with sterilized water, afterwards a dressing should be applied of either sterilized or bichloride gauze.

The instruments are best sterilized by boiling them for fifteen minutes in water to which a little washing soda (carbonate of soda) has been added. In treating infected wounds, abscesses, etc., some surgeons claim that free drainage is all that is necessary, but, in my opinion, the far better method is to treat the same antiseptically by using peroxide of hydrogen and washing with bichloride solution 1 in 2000, and applying bichloride gauze.

Strapping. — How necessary it is to know how to do strapping, and to do it well. Comparatively few country physicians pay much attention to it. If they do attempt it, it is usually done in the most crude and unfinished way. The plaster, of which I prefer the oxide of zinc adhesive plaster, can be gotten in narrow strips so that it can be neatly and evenly applied. I believe one of our best treatments for ulcer of the leg is strapping, yet I dare say but few physicians do it. In sprains it is our most useful treatment also.

Poultices. — Though poultices are used much less than formerly, they, however, do serve a good purpose at times. In inflammatory affections of the joints and of bones, when combined with rest, their action is most satisfactory. In

cases of deep suppuration by their relaxing effect upon tissues they are useful and do not prevent the surgeon from using all aseptic precautions at time of operating.

Intravenous Injection and Infusion of Saline Solution. — It has been proved that normal salt solution will sustain the heart for a varying length of time as well as blood itself. Every physician should have an infusion set in his emergency bag and in his obstetric case, and should know how to use it. In profuse hemorrhage, severe cases of shock, septicemia and uremia it is invaluable. In puerperal eclampsia, our best treatment, if the case will permit, is to do venesection and transfuse or infuse normal saline solution, until a sufficient quantity has been introduced into the circulation.

Anæsthetics. — Anæsthetics may be local, regional or general. Of the local anæsthetics, the best are cocaine and chloride of ethyl. I have found the chloride of ethyl rather unsatisfactory; as to cocaine there is no question of its real efficacy, and as a rule the small percentages are as good and much safer. From a one to two per cent. solution usually being strong enough for all practical purposes. Special care should be used when it is injected into the urethra, for frequently unpleasant effects are noted even when very small quantities of a one to two per cent. solution are used. Cocaine, when hypodermically administered, is very useful for operating upon fingers, toes and parts easily constricted: also for opening abscesses, removal of superficial tumors, etc. It is probably used for nose and throat operations more than in any other branch of surgery. A weak solution of supra-renal extract can be used in place of cocaine. Regional anæsthesia, I have had no experience with as yet. General anæsthesia may be produced by administration of various anæsthetics according to choice. Ether, however, is the more generally used. One of the most important things for a country physi-

cian, who is bound to meet and ought to be able to master all sorts of emergencies, is to know how to administer an anæsthetic properly. I know when I was in the hospital, and undoubtedly it is so now, the most recent man on the staff always gave the anæsthetic. I am glad now that the new man did give it, for if one is observant he learns a great deal by having to give it when there is an operator at work who will blame everything to him, if anything goes wrong. I have often thought, when I have seen a physician trying to give ether and telling his patient at the very commencement to take long, deep breaths, that I would like to take the inhaler and crowd it over the doctor's face and make him take a few deep breaths. One has to take ether himself once to realize what that first feeling of strangulation is. It is unpleasant for any one to take, but it can be made comparatively easy by beginning rightly and having the patient breathe slowly at first, holding the inhaler at a distance, then gradually closer until anæsthesia is complete, when it is astonishing how little ether will keep a patient profoundly unconscious. Every one should be aware of the possible accidents which may occur and be ready to do anything that may be necessary. I remember at one time, when I was an interne, seeing a young doctor giving ether and suddenly a frightened expression appeared on his face — the patient's heart had stopped beating, his respiration had ceased, he was apparently dead. Various things were resorted to instantly without avail, finally the doctor said, "Damn it, why did you die on my hands?" and at the same moment struck the patient with his fist quite a severe blow directly over the heart. Almost instantly the heart began to beat and the patient to breathe and the apparently dead came to life.

I have never tried that treatment myself, as I have had no occasion to do so. No one should give an anæsthetic without being ready with his hypodermic to give strychnin, atropin, or digitalin as the case may need.

Treatment of Hemorrhage. — It is very essential a physician or surgeon should have a good knowledge of the anatomy of the blood vessels that he may know at what points pressure applied will do the most good in controlling hemorrhage. The varieties of hemorrhage, arterial, venous, or capillary, may be primary or secondary. Treatment should be both constitutional and local. Constitutional treatment consists in keeping the patient in a recumbent posture and avoiding any sudden change in position which might cause fatal syncope. I believe opium to be a valuable remedy in these severe cases. Some authorities think it is contra-indicated on account of its raising blood pressure, but it is certainly useful where a patient is very nervous. Stimulants should be, or should not be, used as the exigency of the case demands. Infusion of normal saline solution should be resorted to when necessary. Local treatment consists in using means, temporary or permanent, to control the bleeding. Digital pressure to parts, or to main artery, will control for the time arterial bleeding. A moderately tight compress will usually control hemorrhage until the parts can be sewed. Every physician ought to have in his emergency bag a tourniquet as well as hemostatic forceps for arresting hemorrhage. A tourniquet should not be allowed to remain for too long a time lest paralysis or gangrene follow its use. It is, when one is brought face to face with a severe post-partum hemorrhage, that he wants to know all the various things for controlling it, but more than all he wants to know how to keep his head level and use intelligently and quickly the means he has at hand, or should have, in every case. There is one thing which I think is too often forgotten in these cases which is quite sure to check it, that is compression of the abdominal aorta and keeping it compressed until uterine and vaginal tamponing has been done if necessary. In nose bleeding antipyrin in five per cent. solution has

served me well when packing has not been resorted to. All arteries of any size should be ligated when possible. Secondary hemorrhages are much less frequent since the days of anti and asepsis, but when occurring should be treated as primary.

Shock.—Shock is a condition of physical depression or prostration which may develop following severe injuries or operations. Feeble action of the heart and paralysis of the blood vessels cause an unequal distribution of the blood. Abdominal veins become distended, right side of the heart engorged and amount of blood in arteries correspondingly lessened. Brain and lungs become anæmic. If this state continues, the action of the heart is stopped. The essential condition of shock is inhibition of nerve force and reflex paralysis. It may develop immediately after injury or later. The degree of it is usually proportionate to injury, but there are some exceptions, as contusion of viscera, etc., which though slight is often followed by grave or fatal shock. Burns and scalds, if they involve any considerable portion of the body, are apt to be followed by severe shock. I remember well cases of burns coming to the hospital in apparently good condition, and not an extensive surface burned, but dying within a few hours. In the treatment for this condition the first indication is to establish reaction. The patient should be kept very warm by being covered with blankets and surrounded with hot water bottles, but using every precaution not to burn him. Foot of the bed should be raised and patient's head lowered. If he can swallow give whiskey, aromatic spirits of ammonia, by mouth, and strychnin hypodermically; when there is profuse sweating use atropin hypodermically also. An infusion of normal salt solution is to be used if necessary.

Fractures.—What an important subject to all, but especially to the country physician. I wonder how many of us younger men felt, when we graduated from college,

that we knew well how to reduce and keep in place, in the best manner, the common, to say nothing of the uncommon, fractures. I had seen during my whole college course but few fractures and dislocations attended to. I had seen appendectomies, hysterectomies, etc., without number. No one was going to be willing I should perform any of these operations at the first, but I was likely to be called upon to reduce a fracture or relocate a dislocated bone at any time. I could put a bandage around it, go to my office and look up the different ways of dressing that particular fracture, go back to my patient and do the best I could. Tell him he would probably have a deformity, but if nature did her work all right he would get a useful member. The colleges have heretofore been deficient in their real practical training in the very things which are so essential to the young physician in the beginning of his practice. Work improperly done at this time militates against him perhaps for a life time.

Operations.—There are certain operations which a physician should endeavor to familiarize himself with, for when the emergency arises to do them he must act promptly or his patient is promptly dead. I refer more especially to the operation for strangulated hernia. To be able to operate for this a good knowledge of the anatomy of the parts is essential. The physician must also have confidence in himself, and be able to inspire the same in others, and then must go ahead feeling that it is his duty to do the very best he can for his patient, under circumstances which will allow no wavering, and when prompt action will often be rewarded with a life saved and hesitancy be reproved with a life lost.

"Call not on Hercules for help: his aid
Ne'er serves the man who will not serve himself.
Thine own arm must the conflict meet,
Thy purpose being the victory."

In conclusion I wish to say that in our thirst for major surgery and the wonderful operations which stand pre-eminently as the great advancement in the science of medicine of the present age, let us not forget our duty as physicians and surgeons to attend well to the minor surgery which must necessarily enter into our daily work. Be well prepared so as to be ready at a moment's notice to attend to any ordinary kind of emergency which may arise. For minor surgery in country practice is no small part of a physician's work and is a part which tells for or against his reputation most markedly.

> "He who does the best his circumstance allows
> Does well, acts nobly, angels could do no more."

DISCUSSION.

Dr. STEVENS, of ———— : After listening to this interesting paper I have very little to add. The reader seems to have covered the field, which is indeed a broad one. Speaking of bandaging and the avoidance of tight bandages;—the hospital intern can see his dressings several times a day, but it is different with the country doctor. When he puts up a limb or does up a finger or hand it is often left for twelve hours. It is well to bear in mind that it is going to swell at first probably.

As to the question of asepsis and antisepsis, rubber gloves to-day are a great help to us.

A word about bichloride tablets. It has been my misfortune in the last year to see two cases of poisoning by bichloride tablets. The country physician and surgeon often has to leave bichloride tablets at the house, and the utmost care should be taken with them.

I think that there is a great deal of value in formaldehyde solution, especially in pusy wounds, cases seen late, — 1 to 40 formaldehyde solution, a teaspoonful in a quart of water.

It is pretty strong and smarts. It has a fine action on pus cavities.

Lysol is a valuable addition to our antiseptic surgery. I like creolin and moist bichloride poultices rather than the old-fashioned flaxseed poultice. Covered with paraffine paper the heat is retained.

I want to congratulate the speaker on his mentioning carrying the saline apparatus. We can get to-day our normal salt solution tablets made so as to dissolve them readily in boiled water. Representing the country physician and surgeon, I always carry a large bag. We don't know what we are going to until we get to the case.

Although a Harvard man, I like chloroform used in the proper cases. When a student I heard very little spoken about chloroform. It was always ether. I use more and more each year, but confining it to proper cases, especially young subjects with fractures. I like ethyl chloride. In short operations like tapping the chest I think you can anæsthetize the skin so that there is very little pain.

It is well to examine the urine before giving any anæsthetic. Another thing that presents itself to the country doctor, especially in manufacturing places:—cases are apt to come from the factories after a meal, and you have a great deal of trouble with the full stomach; things we never used to see in hospital work.

In the matter of hemorrhage I think there is one alkaloid of great value, and that is hydrastinine. I saw last year a case where there was oozing from all the mucous membranes apparently, and various things had been tried and hydrastinine controlled the bleeding. I do not think the patient was bled out either.

If there is anything more troublesome than to be called to a bleeding tooth cavity in the night I don't know what it can be. Take 1 to 1000 adrenalin solution on absorbent cotton and pack the cavity firmly and it will almost instantly stop the bleeding. It is said to be good in eye and nose work, as well as for hay fever.

As to the question of shock, one thing struck me as important, — care as to overdose, — because absorption is slow after shock, the whole system is devitalized, the dose does not seem to act, and you repeat and finally get overaction.

As to fractures, it is well not to be in too great a hurry to apply the permanent dressing. Reduce the fracture and wait for acute inflammation to subside. Placing an ice-bag I find is a great help. I believe strongly in plaster-of-Paris bandages properly applied.

If I am to operate I always try to have the room disinfected the night before. Formaldehyde comes in candles, and the room can be disinfected in that way. If time is limited I direct not to disturb things, such as pushing curtains up and cleaning off mantels.

Dr. H. O. Marcy, of Boston: There are said to be no minor things in life. The criticism I make on this admirable paper is the title — minor surgery. It is not minor in the slightest sense. It does us all good to review these fundamental principles of our work, and I am quite sure that we can all learn very much from such teaching. Personally, going over the history of a long life devoted to surgery, I now criticize my seniors rather than my juniors. In earlier days I was operating all over New England, and then ether was given by the family physician, usually little skilled as an etherizer. How few physicians to-day know how to give an anæsthetic! I have often said I would give half the fee if I could have my etherizer. I believe faulty instruction in regard to etherization explains why ether is not given more outside of New England instead of chloroform. An impervious cone is usually used for administration. Nothing could be more faulty. Instead of a cone we should have a cylinder. Make the cylinder sufficiently open to carry the full volume of air the patient desires to breathe. Air plus ether and avoid asphyxia. Not long ago I had a good general practitioner give ether and came near losing the patient from his incompetency. He did not know that the patient must have plenty of oxygen with the ether. Such experiences, sometimes called minor, are the reasons why older men should review fundamental principles.

I criticise the injection of the peroxide of hydrogen into deep wounds. It is not so much of a disinfectant, destroying the bacteria, as we have sometimes thought, but an admirable means of disseminating them.

I find fault also with the late application of fixed, plaster, splints in dressing fractures. Put up a fracture as early as you may in a fixed apparatus. Reduction, retention, rest, not constriction, are the three Rs of importance. The very first changes within the first few hours are processes of repair. What wounds shall we drain? Emphatically no wound that is aseptic. The primal exudation of leucocytes is of perfectly normal type, and is the "first aid to the wounded" if the wound is aseptic.

Dr. D. H. Craig, of Boston: The matter of rubber gloves was alluded to. The man who has to do the whole work, who has no assistant to help him in a country practice, oftentimes cannot properly sterilize his hands and get everything ready for an operation and maintain his hands in a sterile condition. If we have everything to work with the last thing to do would be to put sterile hands into sterile gloves. But we can carry a pair of sterilized gloves to the operation, and these may be put on hands not perfectly sterile, if one has to do everything himself.

In the shock following severe traumatism the use of the adrenalin chloride in the dosage of ten to twenty minims of the one to one thousand solution properly diluted in perhaps one of the best in conjunction with strychnin and we have not the danger of cumulative action of strychnia after the first shock is over.

In relation to the use of anæsthetics I had a point very forcibly brought to my mind recently which I think is not very generally known. In the use of chloroform or ether the sphincter muscles are the last to yield to the influence of the anæsthetic. If the patient is in the condition of collapse, and you rapidly and forcibly stretch the sphincter ani, you almost invariably produce a gasp which will result in regular breathing following.

ARTICLE XXIX.

INFERENCES TO BE DRAWN FROM THE EXAMINATION OF THE GASTRIC CONTENTS.

By ELLIOTT P. JOSLIN, M.D.
OF BOSTON.

READ JUNE 9, 1903.

INFERENCES TO BE DRAWN FROM THE EXAMINATION OF THE GASTRIC CONTENTS.

The gastric contents are examined chiefly to aid in the diagnosis and treatment of catarrh, dilatation, ulcer, cancer and neuroses of the stomach or to obtain proof that it is in a healthy state. The list is a small one. In reality the diagnosis of the various diseases of the stomach is far easier than usually thought. The rule of exclusion can be used to great advantage.

The data upon which diagnoses are based are also few, some six in number. Five of these can usually be detected by gross observation, while the chemical tests for the remaining are extremely simple. The subjects which admit of discussion to-day are: 1. Gastric Motility. 2. Gastric Secretion. 3. Gastric Fermentation. 4. Mucus. 5. Blood. 6. Pus.

Another function of the stomach—absorption—is not included in this list. Absorption may be disregarded, because so little takes place through the walls of the stomach. Practically no water is absorbed. When water enters the stomach, it is either expelled through the pylorus, the cardiac orifice or remains. There are one or two exceptions to this rule of the non-absorption of food in the stomach. Sugar and peptones are absorbed to a slight extent, varying with the concentration of the solution. Alcohol is readily absorbed, as is manifested by clinical experience. When alcohol is absorbed from the stomach, water is secreted into it in more than equivalent volume. Since absorption is of such minor importance, the iodide test for it is superfluous.

1. Gastric Motility. The power to expel its contents is the most important function of the stomach. If secretion utterly fails, there occurs only a moderate impairment of digestion. This is due to the compensatory action of other digestive organs. Let gastric motility fail, however, and distressing, urgent or fatal consequences invariably ensue.

Gastric motility is disturbed by various means. Perhaps the commonest is that due to weakness of the gastric muscles themselves. This may form part of a general muscular weakness and is often associated with a displacement of the stomach and frequently of other organs. Such a displacement increases the work to be done by the stomach because the pylorus is more firmly fixed than the rest of the organ and the food must be raised before it is expelled. A vicious circle is the result.

Another cause less generally appreciated is interference with the continuity of the inner wall of the stomach. Such a state is brought about by an ulcer or cancer, even when they do not obstruct the pylorus. The interference with motility in such cases is not extreme, but it is quite constant. The detection of slight degrees of disturbed motility is therefore important and a suspicious sign.

Obstruction to the passage of food through the pylorus is the most obvious cause of disturbed muscular action in the stomach. At first the obstruction usually leads to extra efforts on the part of the muscle walls. This is apparent to the patient by the sensations produced and to the physician by his observance of peristalsis. In the advanced stages of this condition exhaustion of the muscles apparently succeeds to active peristalsis and the most extreme grades of dilatation of the stomach result. It is often impossible to determine the cause of a pyloric obstruction at a first visit and it is unwise to attempt a diagnosis. Repeated observation of the behavior of the stomach under varying conditions is essential. In many instances time

alone will determine whether the stricture is functional, being due to spasm, or is organic from the presence of a scar, ulcer, cancer or other less common causes.

The determination of gastric motility is the most important test in the diagnosis and treatment of disorders of the stomach. Frequently proof of its derangement is afforded by the story of the patient. Food is vomited which has been eaten more than seven hours previously, or quantities of food are vomited which are so large that they are directly suggestive of a dilatation of the stomach. This is acute or chronic according to the frequency with which such vomiting has occurred. A degree of muscular disturbance sufficient to produce such symptoms is rare, but even when it occurs it is not uncommonly overlooked. It must not bias the practitioner, however, in favor of malignant disease any more than marked loss of weight in an individual with indigestion.

In contrast with this crude method of estimating gastric motility is the accurate test of this function by the passage of the stomach tube into the fasting stomach. The fasting stomach should be empty. If food is obtained from it seven hours after a meal it can be assumed that there is disturbance of gastric motility. This examination is the simplest and most valuable of all examinations of the stomach which are made. In the first instance, the manipulation of the tube is easier with the fasting stomach than after a test meal. In the next place, the contents so removed are more readily examined. Inspection alone will determine the presence of food, secretion, fermentation, mucus, blood and pus—the essentials for gastric diagnosis. Too much cannot be said of the value of the examination of the fasting stomach.

Conclusions regarding gastric motility may be reached by measuring the quantity of food removed from the stomach one hour after the administration of an Ewald test

breakfast. The slice and a half of bread and the glass and a half of water of which this consists should leave a residue of not more than three ounces when removed under the above conditions. Excess of this quantity suggests a deranged muscular activity. Another method of reaching the same result is to give Hemmeter's test meal. This consists of one small piece of beef (2 2-3 oz.), one soft boiled egg, one ounce boiled rice, one-half pint milk and a piece of bread. Four to five hours later an Ewald test breakfast is given and the contents removed in one hour. The complete disappearance of the earlier meal points to normal motility. Gastric motility has been tested in still another way by directing the patient to eat at night a few spoonfuls of dried English currants. These would not be found on the following morning in a healthy stomach.

Normal motility is present in two diseases of the stomach —gastric catarrh and in the group of cases included under the term achylia gastrica. In the latter instance excessive motility has been supposed to be present. This idea may have arisen from the fact that undigested fragments of food are expelled with difficulty through the stomach tube. The stomach is then considered empty when this is really not the case. The water has passed on, but the solid particles of undigested food remain and can be obtained by prolonged expression, aspiration or lavage.

2. Gastric Secretion. — The healthy stomach produces about three pints of gastric juice in twenty-four hours. Ordinarily this passes on with the food into the intestine without causing disturbance. It is obvious, however, from what has been said of the slight degree of absorption which takes place in the stomach and the various conditions in which the muscular power of the gastric wall is affected, that such quantities of secretion can cause many symptoms. Much confusion exists between slight degrees of deficient motility and excessive production of

gastric juice. But the pronounced states of either are clear. When the secretory function is in a normal condition the fasting stomach will be empty; if hypersecretion is present, varying quantities of gastric juice up to several ounces can be removed from the fasting organ. Increased secretion of gastric juice is pathognomonic of no single disease. It most frequently occurs as a neurosis in connection with an overproduction of hydrochloric acid. It is a precursor of ulcer of the stomach and is the signal for prophylactic treatment. It accompanies ulcer.

The constituents of gastric secretion which are most important for recognition are hydrochloric acid and pepsin. Their presence in normal quantities may be inferred with great probability from the gross appearance of an Ewald test breakfast. Such contents removed from a normal stomach look "well digested." If gastric secretion is absent the contents resemble closely a mixture of bread and water. It is not safe, however, to rely wholly on gross appearances, for occasionally with excessive amounts of hydrochloric acid a somewhat similar condition is produced.

The safest test for hydrochloric acid is with Günzburg's reagent.* This is performed by slowly heating a few drops of this solution with an equal amount of the stomach contents. A red color develops. Another test is with Congo red paper.† This turns blue when moistened with a

* Günzburg's Phloroglucin-Vanillin Test.

Phloroglucin	2
Vanillin	1
Alcohol	30

† Filter paper saturated with aqueous solutions of Congo red of the following strengths will react with the given per cents of free hydrochloric acid.

Congo Red.	*Hydrochloric Acid.*
Per cent.	*Per cent.*
0.001	0.200
0.00175	0.150
0.0025	0.075
0.0062	0.050
0.01	0.025
0.05	0.01

solution containing free hydrochloric acid. The development of a brownish color with Congo red denotes the presence of some organic acid. Congo red paper is very useful in a general practice because it requires no apparatus. Following a suggestion of Dr. Pfaff, it can be prepared in different strengths and with these an approximate idea of the per cent of free hydrochloric acid in the stomach can be obtained.

Excess of hydrochloric acid occurs most commonly as a neurosis. It is the torment of the nervous dyspeptic and the nervously tired out individual. Like hypersecretion it frequently precedes ulcer of the stomach and generally accompanies the condition when established. Often hyperchlorhydria occurs in dilatation of the stomach due to a benignant stenosis of the pylorus. In such cases the stagnant food appears to call it forth. Ulcer is usually associated with the presence of free hydrochloric acid, often in excessive amounts. In cancer, free hydrochloric acid is the exception. It is by no means seldom, however, that a chronic ulcer exists without free hydrochloric acid and that a cancer is accompanied by free hydrochloric acid. In the latter instance the cancer has usually developed from an old ulcer — a much rarer condition than supposed.

The hydrochloric acid is diminished in catarrh of the stomach to a greater or less extent according to the severity of the disease. It is completely absent in atrophy of the mucous membrane and sometimes absent when no atrophy exists, perhaps due to a secretory neurosis. Patients in whose gastric contents no hydrochloric acid can be found after repeated trials are said to have achylia gastrica. (Strictly speaking, the absence or marked diminution of pepsin and rennin also should be proven to establish this condition.) The acidity of such contents hardly suffices to react red with litmus. The gross appearance of an Ewald test breakfast removed from a patient with achylia gastrica

resembles a mixture of bread and water, so incomplete is its digestion. It is a rule for the hydrochloric acid to be absent in cancer.

Pepsin varies in the gastric juice to a greater or less extent with the hydrochloric acid. In most examinations of the stomach contents the tests for it can be omitted. It can be demonstrated as follows: Add a portion of the white of a hard boiled egg of about the size of a dime to two drachms of filtered gastric juice. Keep at body temperature. The egg normally is digested or disintegrated in two to six hours. If free hydrochloric acid is not present, add dilute hydrochloric acid one drop at a time until its appearance is shown by Günzburg's or the Congo red test.

3. Gastric Fermentation. — Fermentation in the stomach is proof of diminished motility. It is recognized by the appearance of three layers in the gastric contents which form about a quarter of an hour after their removal. This is best shown by placing the contents in a glass. The lower layer consists of partially digested food, the middle layer is liquid and contains the soluble products of digestion, while the upper is frothy, due to the admixture of gas (chiefly carbonic acid) with small particles of food. The exciting agent of the fermentation varies, and as Dr. Hewes has shown to the students of the Harvard Medical School this year can be isolated. Especial interest attaches at present to but two sorts of fermentation, that caused by sarcinæ and that due to the lactic acid bacillus. Sarcinæ grow abundantly in the presence of hydrochloric acid and lactic acid bacilli only in its absence. The presence of sarcinæ therefore implies fermentation in a stomach which is still secreting hydrochloric acid, while lactic acid implies that no hydrochloric acid is being produced. In both, motor insufficiency is present. Sarcinous fermentation has a peculiar odor which is so distinctive that when once appreciated it is easily recognized. The sense of smell alone

can in this way lead to a conclusion that hydrochloric acid is present. Conclusive proof is afforded by the detection of the "cotton bale" shaped sarcinæ under the microscope. Lactic acid is demonstrated by the distinct appearance of a canary yellow color on the addition of filtered gastric contents to a nearly colorless solution of ferric chloride. The demonstration of sarcinæ or lactic acid in a stomach contents adds therefore nothing new to our knowledge. It is simply another method of showing that a state of deficient motility, associated with or without hydrochloric acid, exists.

4. Mucus. — Mucus is present in the stomach when there is catarrh of that organ. Acute or chronic gastric catarrh exists only when associated with mucus. The acute cases attract little attention, for the duration of the disease is so short that an examination of the stomach is seldom necessary. Chronic catarrh of the stomach is a rare disease, notwithstanding it is so common in the minds of the laity, and for that matter in the diagnoses of the profession. In a recent four months' out-patient female medical service in which about one thousand new patients were seen, only one typical case of chronic gastric catarrh was recognized. In fact one of the decided advantages of the examination of stomach contents is the opportunity it affords of disabusing the patient's mind of the idea that he or she has a chronic catarrh. On the other hand it must be remembered that catarrh may exist with cancer or dilatation of the stomach. The mucus obtained from the mouth, throat and œsophagus during the passage of the stomach tube should always be distinguished from mucus formed in the stomach. Gastric mucus is intimately mixed with the food, other mucus is not. Mucus is most easily detected in the fasting stomach.

5. Blood. — Blood is not uncommonly obtained from the fasting stomach. Cancer is the disease most uniformly associated with it, for either a little blood is present in the

stomach before the introduction of the tube or is set free by the irritation of the tube itself. Ulcer behaves similarly. Very small quantities or little clots of blood are frequently obtained from patients with achylia gastrica. These three diseases can often be differentiated by the state of gastric motility and the hydrochloric acid. Blood may also be obtained from the healthy stomach by too forcible straining and struggling on the patient's part or too powerful aspiration of the contents by the doctor. Coffee ground vomitus perhaps is more commonly associated with cancer than with ulcer, but it is by no means proof of it. It may occur daily for a week in ulcer.

6. Pus. — Pus is common in any gastric catarrh. It is frequently met with in the fasting stomach of patients with cancer or ulcer and so in the absence of mucus gives valuable evidence.

Diseases of the stomach can be treated empirically or with a certain degree of scientific accuracy. The scientific method is usually successful while empiricism favors a migratory tendency on the part of the patient. If, on the other hand, empiricism is successful and the patient is cured, in the end more real harm results, for the doctor is encouraged to repeat his lucky experiment and his medical progress thereby comes to an end.

The examination of gastric contents is often neglected, because it is thought to be too difficult and too time-consuming. These views are erroneous. The examination requires no more time than the examination of the urine, and is far simpler. In fact the gross examination of the gastric contents furnishes the most valuable data of all, and these can be recognized almost at a glance. There is no necessity for the busy practitioner to titrate the percent of hydrochloric acid in the gastric contents. It is far more important that he should determine whether the organ con-

tains food and secretion in the fasting condition and that he should make the simple tests necessary for their examination. More important still is the need for a proper interpretation of the results so obtained.

Rules are no more hard and fast in this branch of medicine than in any other, and satisfactory deductions can only be drawn when the history of the patient, the physical signs and the data relative to the contents of the stomach are considered together.

DISCUSSION.

Dr. R. F. Chase, of Brookline: Dr. Joslin has very thoroughly and concisely discussed a very broad subject. He has left very little to be said upon this subject. There are, however, a few points to which I wish to refer with the object mainly of emphasizing their importance:

When a patient comes to the physician for an examination of the stomach, he should not have eaten anything for at least six hours.

With a fasting stomach the physician can at once proceed to give a test meal and later examine the gastric contents obtained therefrom. Or, should it seem preferable, he can obtain the fasting contents (if there are any) then inflate and determine the size and position of the stomach.

Either part or the whole of such an examination may be made at the first visit, providing the patient comes with a fasting stomach. Whereas if he comes with a full stomach none of these tests can be conveniently carried out at the first visit. Dr. Joslin has already said that several examinations may be necessary to establish a diagnosis.

I particularly desire to emphasize the importance of this point, because I know there are physicians who have the impression that one chemical examination of the gastric contents is sufficient to enable one to make a diagnosis of any gastric affection. Such, however, is not the case. Besides the chemical examination of the gastric contents, the

size, shape and motility of the stomach must be determined in all cases, and in many cases new phases of a disease appear which require prolonged study that they may be recognized and properly treated.

The average amount of gastric contents obtained one hour after the administration of an Ewald test meal has been stated by the reader as 90 cc. or three ounces. I consider this amount a very fair average, but one must remember that it is only an average, the maximum and minimum normal limits being very wide, varying from about 20 to 150 cc.

A healthy student upon whom I recently made some tests yielded, on several successive days, from 120 to 160 cc. of gastric contents. On a certain day preceding a school examination which he was to take, I was able to obtain only 10 cc. one hour after the Ewald meal and this gastric juice contained no free HCl., whereas on the previous examinations the free HCl. had always been normal. This temporary suppression of the gastric secretion I attributed solely to nervousness arising from anxiety over his pending school examination.

Small amounts of gastric contents are obtained in the conditions referred to by Dr. Joslin, viz., in diminished secretion, in hypermotility of the stomach and in cases of patent or lax pylorus.

In these conditions it is frequently, I may say usually, necessary to introduce the stomach tube within thirty or forty minutes after giving the Ewald meal, to obtain any contents for examination.

Failure to obtain the average amount of gastric contents one hour after the Ewald meal does not necessarily indicate the existence of one of the conditions just mentioned, it may mean that the entire contents of the stomach have not been removed.

Lavage of the stomach will clear up this point, because if the contents have not been entirely removed crumbs of bread and cloudiness of the wash water will be observed. Formerly I used (as recommended by some) a Davidson's syringe bulb in evacuating the stomach contents and in 20 to 30% of all cases I obtained small amounts of blood. I now use a different bulb and do not encounter blood in

more than 2 to 4% of all patients. Small amounts of blood, however, are frequently of no significance.

Mucus must *not* be confounded with saliva, which as a rule runs freely down the *outside* of the tube. The former is recognized by its stringy nature and comes of course only from the *inside* of the tube, it is also well seen when pouring the contents from one vessel into another.

Excepting the detection of blood, or food which has been eaten one or two days previous, an examination of the vomitus from a patient does not aid one much in the diagnosis of gastric disease.

Dr. Joslin has stated that during a three months' hospital service he has failed to encounter one case of chronic gastritis.

During a present ten weeks' service I also have not met one case of chronic gastritis.

This disease of the stomach, of which we hear so much, is not nearly as common as is generally supposed.

ARTICLE XXX.

THE DIETARY TREATMENT OF CONSTIPATION.

By HENRY F. HEWES, M.D.
OF BOSTON.

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THE DIETARY TREATMENT OF CONSTIPATION.

During my practice of medicine, in which through my hospital clinic and special branch of work I come in contact with large numbers of patients already under treatment at other hands, there is no fact which has impressed me more that the universality among the profession of the incorrect treatment of the condition of constipation.

To reinforce this statement let me take an extract from the records of my Out-Patient Clinic at the Massachusetts General Hospital. In this clinic, out of a total of twelve hundred cases seen during the months of July, August and September, 1902, six hundred and ninety, or fifty-one per cent., gave a history of *habitual* constipation. Of these cases of habitual constipation, six hundred and sixty, or ninety per cent., were using for this complaint a regular dosage of drugs which had been at some time prescribed for them and had used drugs from the time of their first medical consultation on the subject, having received no other directions for treatment excepting possibly that of a regular habit as to time of operation. Of the remaining ten per cent. of cases a few had received general directions as to diet along with their drug prescriptions, and the remainder were using no treatment at all.

A review of the records of my private practice shows a very similar set of results. In this practice, practically all the cases of constipation seen were using drugs for relief. About half these cases, as against five per cent. in the hospital cases, had received directions as to diet and habits in connection with their treatment. But in all cases drug treatment was associated with the diet and regime from the start, and there were no cases in which a pure dietary treatment had been instituted at the start or in which a systematic transition from a mixed drug and diet treatment to a pure dietary regime had been planned.

The result in both hospital and private cases was that in a great majority we had no real improvement in the underlying condition as the result of treatment, but on the contrary a much more fixed habit, both physical and mental, and a need for constantly increasing or changing drug dosage for temporary relief superimposed. All these cases had been treating for constipation for a year or more, and in none had the necessity for drug dosage lessened.

Of course, there are physicians who prescribe diet and regime pure and simple for their cases of habitual constipation, and, of course, there are cases of constipation treated by drugs which if the dosage and habits of the individual are carefully managed are cured. And drugs may be useful for temporary conditions. But the general facts emphasized so clearly by these records quoted above, that the use of drug treatment with or without dietary or regime directions for *habitual constipation* is practically routine and universal in the profession, and that such treatment is in a large per cent. of the cases ineffective as regards cure, are undoubtedly true.

There is no necessity for me to dwell upon the fact with you that this condition of things is all wrong from the point of view of good medicine. The regular use of drugs to preserve the continuance of or to stimulate a physiological

function is always a debatable measure, and one which should be established or maintained only after a thorough search for and trial of more natural methods of relief. And this is particularly true where the weakened or disturbed function has become so, as is the rule in the condition of which we are treating, as a result of some faulty hygiene rather than through actual organic disease.

We wish to cure our patients, not to relieve them, and certainly not to make them victims of drug habits. And when the patient shall pass from us to some other guardian we wish to leave as the result of our work not a harder but an easier task for our colleague.

The consideration of these facts, thus emphasized in practical experience, has led me to an extended study, partly experimental, of the subject of the treatment of constipation in general medicine, and it is the results of this study or of a part of it which I wish to present to you to-day.

The direct object of the study has been (1) to establish a method of determining as far as possible in a given case the source or underlying causes of the constipation present.

(2) To ascertain a method or methods of treatment of the condition in its various manifestations which will tend to establish the natural physiological function as far as possible as a permanent and self-supporting condition.

It is taken for granted in the study that the function is one which should go on in every individual independently of external artificial aids other than those which are always present in the natural course of hygienic existence, namely, the food, bodily exercise, and a regular habit.

Where this regular physiological function is lacking, that is in any case of constipation, we can assume that we are dealing with one of two general propositions. Either the patient has some definite pathological lesion or condition, as some obstruction to the intestine, some lesion of

the nerve mechanism of its function, or some general disorder of metabolism which affects the normal action of the intestines, or he is living under a faulty condition of hygiene as a result of which the natural forces or stimulants of the physiological function are lacking. And our course in the study of our case is to determine in how far either of the above elements the pathological, or the physiological, is an underlying factor; and if the pathological, what its nature is, and then proceed directly to the removal or remedying of the cause or causes as the fundamental step in the treatment of the case.

Now acknowledging that a faulty hygiene, a lack of the natural agents or stimulants of physiological action, may be a cause and a total cause of constipation, and this fact is proven beyond all doubt by extended research, very definitely also, as you will see, by the results of this investigation which I am presenting to you, the proper plan of treatment in all cases is clearly, whether a definite pathological cause has been determined as an associate in our case or not, to effect at the start as far as possible a correct hygiene in this respect. If the faulty hygiene is the cause of the constipation, this measure will cure. And whatever our cause or causes may be, this step is in the right direction as establishing at the start one correct factor of treatment, and at the same time helping us to a diagnosis of the actual casual condition of our constipation by exclusion, and assisting in the cure whatever this further condition may turn out to be. If an underlying pathological condition is present and the constipation fails to yield to correct hygienic regime we can then proceed to the removal or remedying of this cause by further means.

And here again in our second step we must keep equally in mind the fact that we are working to establish a normal physiological function which should go on of its own accord independently of artificial aids, and that whatever relief we

may obtain by artificial means, as for example drug dosage, a cure can be said to have been established only when the function does go on unaided excepting by natural agents as food and hygienic measures. That is, if besides removing or remedying a definite cause as an obstruction, a weakness of innervation, or faulty metabolism, an anæmic condition, by appropriate treatment, we find it necessary to stimulate or control the intestinal functional action of secretion or motion, we must do so as far as possible by the employment of those means, increased in degree but similar in kind, which nature uses for the purpose in hand, that is by the supplementing natural hygienic agents to intestinal action, the inclusion of special foods and extra exercise in the regime. In this manner we depart as little as possible from the normal in the habits of the patient and of his economy and make a final resumption of normal existence under the progressively improving conditions of health more easy to reëstablish. Only as a last resort or for temporary use should we avail ourselves of the assistance of artificial stimulants as cathartic drugs, which from the very nature of their action make a resumption of the normal habit more difficult.

The first step in the rational treatment of a case of habitual constipation is therefore, often regardless of what the associated pathological condition may be, the establishment of a normal hygiene especially in regard to the function of intestinal action.

Experience has taught us that those factors of hygiene which bear most directly upon the physiological function of the intestine are: —

1. The habit of a regular period of defecation.
2. A proper amount of physical exercise.
3. A proper diet.

We must at the start, therefore, advise as to these.

Of these factors the first two explain themselves.

In regard to the third it is necessary first to ascertain the exact nature of the patient's accustomed diet and to supplement this until it corresponds to the normal diet.

The character of the normal diet, that best suited to the average individual and correct according to a scientific study of the body metabolism, is as follows:*

The quantity of a normal diet should average, under ordinary conditions, from 40 to 50 Calories per kilogram of weight, or from 2800 to 3500 Calories in 24 hours.

As regards quality, the best diet for all purposes in the average individual is one which approximates for every 100 Calories of food 51 of carbohydrates, 29 of fats and 19 of proteids, or for a caloric value of 2200, carbohydrates 1100, fats 663, proteids 427. The normal diet should be made up also as much as possible of foods in their natural state cooked or uncooked, and not of artificial preparations of nutritious principles, that is meat, eggs, cereals, bread, vegetables, white and green, fruit, milk, the kind of diet man in this zone has accustomed himself to for ages. (Vid. notes 4 and 5.) It should contain in addition to the food about three pints of water daily.

When we have established a diet for our patient approximating this normal standard we must next consider what further aid to nature can be obtained along these same simple lines.

The constipation in the case may be and frequently is simply due to the absence of the proper regimen. This faulty regimen long continued may have induced sluggish habits of the intestine so that some additional stimulus to action besides the average normal is needed. Or we may be dealing with a condition of atony of the intestine, some weakness of the muscle of the wall or of its innervation where some extra stimulus to action is necessary.

* Rubner—Leyden's Handbuck der Ernahrungs-Therapie. Bd. 1 1897.

In seeking some aid for this stimulation we look most naturally to the food which is the one of our normal hygienic factors affecting the intestine which can be most easily varied or reinforced. That is we include in or add to our normal diet those articles of food which are known to be, among the general foods utilized, those which have most influence on the action of the bowels.

It is a well recognized fact that in addition to the general action of the normal food products upon intestinal action, there are certain food elements which have a more special influence upon this action.

This marked influence of special foods upon intestinal action was first impressed on my mind as a definite scientifically demonstrated fact by some observations of Westphalen.* This observer, in several years of practice in Russia, partly among peasants and partly among dwellers in St. Petersburg, noted the fact that while constipation was a very common affection among the citizens it was almost unknown among the peasants. The same distinction existed even where city dwellers of the same habits of exercise as the peasants were observed. In searching a cause for the fact observed, Westphalen located it in the diet of the two classes. That of the peasant in Russia consists almost entirely of vegetable food, including coarsely ground grains. That of the city dweller as worked out in the writer's tables is made up in much greater proportion of animal food and contains few coarse grains and much less vegetable matter. Taking these observations as a basis for his experiments, Westphalen tried placing patients with habitual constipation on the regular peasant diet, with marked substantiation of the original hypothesis deduced

* Westphalen treated 110 cases of habitual constipation of the type known as atonic constipation by dietary measures pure and simple, using an excessive vegetable diet, occasionally reinforced at the start by oil enemata. Of these ninety-nine were cured without resort to drugs, eleven cases only necessitating the use of drugs, as cascara. Westphalen, Archiv. f. Verdanungs,—krankheiten, B. 6 p. 161.

from his general observatives, that the vegetable diet serves as a marked stimulus to intestinal action.

Starting then with this hypothesis, that the intestinal function may be greatly influenced by the quality of the food, we must in connection with our plan of treatment first study the special action of the various substances in this regard.

A thorough consideration of the various food substances from the point of view of their influence upon intestinal action indicates that the foods having this special action may be divided into three classes, according to their way of producing their influence.

In the first class we have all food substances possessing a large undigested or unabsorbed residue (even when taken in quantities so moderate as not to overtax the alimentary canal). These are principally vegetable substances possessing much cellulose, as the grains in coarse form, green vegetables, fruit, also foods with many seeds as berries, figs, etc. It is this class of substances which predominated in the diet of the Russian peasants, observed by Westphalen, and which was utilized by him in the treatment of constipation.*

The quantity of unabsorbed or undigested residue obtained under ordinary conditions from common food substances can be seen from the following tables taken from Rubner *(loc. cit.)* :

* Rubner has shown experimentally that on a diet made up entirely of animal food, the intestines take three or four days to show the residue, while with a vegetable diet of corresponding nutritive value emptying occurs in from nineteen to twenty-four hours. On a diet of beets rich in *cellulose* (see table, page 537) emptying occurred in four hours.—Rubner loc. cit.

While a fasting stool (observation on the faster Cetti) weighs about twenty grammes daily, a stool from an individual on a average normal diet of meat and vegetable and fat weighs from 100 to 250 grammes. A stool from an individual upon a purely vegetable diet of equal nutritive value to the normal diet averages about 500 grammes.—Hammeter Intestines, vol. 1.

Food.	*Dry residue.*	*Per cent. Unabsorbed. Proteid residue.*	*Per cent. Unabsorbed. Carbohydrate residue.*
Meat	4.9	2–2.6	. . .
Fish	4.3	2–2.5	. . .
White of egg	5.2	2.6	. . .
Milk	8.8	7.8	1
White bread	4.2	21	2.9
Rye bread	20.9	46	14
Pumpernickel	19	43	13
Rice	4.1	20	0.9
Peas	9	17	3.6
Beans	15–18	30	7.4
Potatoes	9	30	15
Crisp cabbage	14.9	18	15
Turnips	20.7	39	18
Beets	20	39	18

This table shows also the carbohydrate residue which may by undergoing fermentation form products which increase intestinal action. These cellulose substances have a further value besides their production of large residue. The cellulose forms material for fermentation in the intestine with formation of organic acids which naturally aids intestinal action.

Another food substance which may serve to reduce residue in special cases of constipation is fat. As a rule the fat taken in normal quantity leaves little if any residue. If an excess is taken, however, a considerable residue may remain which acts also as lubricant of the intestine. Thus Berthé* has shown that in a diet consisting of 350 g. of meat, 500 g. of bread, and 60 g. fat, 7 to 8% only of the fat appears the fæces. If to this diet 60 g. of fat be added, the residue of fat begins to increase after an initial period of extra absorption, rising to 12 on the seventh day, 18 on

* Berthé quoted by Maly Hermann's Handbuck, vol. 1, p. 243.

the twelfth day, 49 on the thirtieth day. The use of fat to increase residue is not, however, quite so much in the purely physiological line as that of the cellulose vegetables first mentioned in this class, as these produce residue even when taken in ordinary amount.

The second class of food substances having special influence upon the intestinal action consists of foods containing considerable quantities of organic acids or other substances which by their local action, or their action upon metabolism or nerve centres after absorption, increase intestinal activity. In this class are certain fruits, especially the *tamarind*, *prune*, *plum*, *manna*, and certain green vegetables.

The third class consists of substances which undergo fermentation in the intestine, with formation of organic acids. These are the carbohydrate foods generally, including the cellulose of the vegetables already mentioned.*

In following out our plan of the dietetic treatment of constipation then, having established our normal physiological diet for our individual we include in it a fair proportion of the above special forms of food, varying the make-up according to the exact nature of our case and the circumstances of the patient.

Thus for the bread in the diet we advise black bread, or whole wheat or rye bread in place of white bread; for vegetables we give cabbage and beets, turnips, lettuce; for dessert we advise prunes or tamarinds.

If the fæces show marked absence of fat we may try giving a large quantity of fat to promote a fat residue. If fæces are already large in quantity but action sluggish, we may be inclined to depend more upon the second class of

* Bokai (Archiv. f. p Path. u Pharm. Bd. xxiv. 1888) shows that the fermentation of carbohydrate foods acts upon intestinal peristalsis chiefly through its products of organic acids (lactic, butyric, acetic acids, and the carbon dioxide). Schmidt, D. Archiv. f. klin. Med. Bd. 6, 1898, shows that the fermentation products of cellulose act upon the intestinal function.

foods, those containing organic acids and stimulant substances, — the prunes and tamarinds, — and to press these excessively.

Whatever the course we may adopt after study or experiment with our special case, we are providing a treatment for our condition entirely along physiological lines, providing natural methods of action, and encouraging no mental or physical habits of artificial aids to action.

I have for the two last years been giving this system of treatment trial in all cases of simple habitual constipation which have come under my care. The general plan of treatment has been as follows:

Each case at the start, besides general directions as to hygiene and health, was instructed to give up the drugs which were in use for the constipation and to depend entirely upon the diet presented for this function.

A complete diet list, providing a diet of sufficient caloric value of mixed food elements, was written out, special emphasis being placed upon the foods of special value in constipation. As dessert, at one or two meals, depending upon the case, the patient was ordered a saucer of cooked prunes, about ten prunes at a time.

An example of the diet list which was written out for each patient at the start may be seen below. In the routine, simply the varieties of food were recorded, the quantity being to a certain extent left to the patient. With a list of this kind it is fairly safe to assume that a patient taking the usual quantities of the foods advised would get a sufficient total quantity to satisfy the normal standard of nutritive value.

The actual nutritive value of such a diet, given in prescribed quantities for each article of food, is given in the second part of the table appended.

TABLE 1.

DIET LIST FOR CONSTIPATION.

Plan diet in following manner, eating the usual quantity of foods presented and using the variety allowed in list:

Breakfast:

Cereal with cream and sugar — preferably corn meal, or rye and oats.
Two soft boiled or scrambled eggs.
Bread — preferably black bread, or pumpernickel, or rye bread, with much butter.
Fruit. — Apples or grapes.

Dinner:

Soup — preferably vegetable soup.
Fish or meat, or both, with salad.
Vegetables — at least two kinds, preferably spinach, cabbage, beets, turnips; potatoes, beans or peas if desired.
Dessert of rice or bread pudding or custard — including daily a saucer of prunes.

Supper:

Bread and butter.
Cocoa.
Cold meat and vegetable salad.
Dessert of stewed fruit — apples or pears or figs. If necessary include a saucer of prunes.

Drink at least three pints of water daily.

TABLE 2.

Breakfast:	*Proteid, gm.*	*Calories.*	*Mineral Salts, gm.*
200 gm. (about 6 oz.) porridge, oatmeal, rye, barley, Indian meal, or wheat . . .	4–6	150–200	4
8 gm. sugar or porridge . .		8	.001
1000 gm. milk or porridge	5–6	120–140	3
50 to 100 gm. bread, 1 to 3 slices	4–7	150–300	.5
15 gm. butter . . .	.2	120	.5
2 eggs, or 50 gm. steak or chops	12	150–180	.5
Fruit—oranges, apples or grapes	0.5–1	50	.1

Dinner:			
120 gm. consommé or chicken broth, or potato, pea or tomato puree with salt	1–5	100–200	1
100 to 200 gm. beef, chicken, lamb, ham, or sweetbread	20–25	200–400	1
Or 200 gm. bluefish, salmon, halibut, cod or mackerel	12–20	150–300	
50 gm. potatoes	1.5	60	.5
100 gm. spinach, asparagus or squash	1	100–200	.5
75 gm. peas, beans, macaroni, or corn	9–15	300	3
Custard, or ice cream, or Indian pudding	6–15	150–250	1
Cheese and crackers	2–5	300	1
Supper:			
Bread and butter	5–7	200	1
Cocoa, one cup	6	150	1
Milk, one glass	8	200	3
Stewed fruit, pears, baked apples, peaches with cake, or griddle cakes	3–4	200–300	.1
	gm.	C.	gm.
Approximately,	80–130	2,650–3,600	21.71

Such a diet was maintained for one or two weeks. Enemata were used when necessary at the start. If at the end of the period the diet worked without aid from enemata, as was frequently the case, the patient was instructed to continue in it, gradually cutting down the prunes and possibly to some extent the proportion of fruits or green vegetables. In this way after a time an ordinary diet with plenty of green vegetables and fruit and an occasional prune dessert was approximated in many cases as a permanent habit.

In cases which were very much the victim of drug habit for their constipation, or in all cases which did not improve after ten days to two weeks of the above diet with the prunes, prunes stewed with a certain quantity of senna were prescribed (one ounce of senna leaves placed in a cheese cloth bag and stewed with three or four dozen prunes).

The patient was told to take a saucer of this dish for dessert once to thrice a day, according to need, in addition to his special diet. After one to three weeks the senna was omitted from the prunes (it was best to have this omitted without the knowledge of the patient if possible) and the patient continued on the regular constipation diet.

It was frequently necessary to use the senna at the start in cases which had depended much upon drugs. Given in the above way it was very easy to gradually lessen the dose while the general effect of the laxative diet was establishing itself, and the mental effect on the patient of the dosage given in this way was not at all the effect of giving a drug for laxative purposes.

In some special cases other methods, as the inclusion of fat excess in the diet were tried. As a rule, however, the above plan was given and adhered to in all cases.

The treatment has now been tried upon 126 cases taken in routine with no selection of cases excepting that cases with obvious pathological lesion as a probable cause of the condition as tumor or definite disease of the alimentary tract were sometimes excluded.

Of these 126 cases 100 were hospital cases and 26 private.

The plan was stated one year ago and all the cases included in the record have been under observation for six months or more. The result of the experiment up to date may be seen from the following table.

TABLE 3.

Total number of cases not heard from 68. (All hospital cases.)

Total number of cases under observation 58.

Number relieved by treatment 54.

Of the 58 cases 40 were relieved by the diet alone, including prunes.

The remaining 18 necessitated senna with the prunes at the start, but all save four of these have finally become able to continue on the diet alone without the senna.

In most cases the relief came at once and continued. In a few it was a matter of one to several months before the result was accomplished, and frequently slight adaptation of the diet varying on the routine plan had to be made for the special individual, as the inclusion of excess of fat or of more organic acid in the diet.

These results indicate two facts very emphatically.

First, that in a very large majority of the cases of constipation which occur in the routine of practice, the chief if not the only cause or underlying condition is a failure of the individual to follow a normal physiological manner of life.

Second, that in a large majority of all cases of constipation taken without reference to the cause or underlying condition, a complete cure, so that the patient can get along without the regular use of drugs or other artificial aids, can be established by a proper direction of general regime and diet.

These results are the more encouraging since a large proportion of them were obtained in out-patient hospital patients whose facility for carrying out the directions was limited. One can not but feel that a treatment which could be so successful under these conditions is one thoroughly adapted to routine practice. On the whole, when we consider that all the patients treated already had the drug habit to some extent, the quick response to dietary regime is quite remarkable and was a great surprise to me as also to the patients. It must be borne in mind, however, that these results were obtained under a method which included extreme attention to and study of the patient, much more than is accorded in the rule where a simple diet list is made out and the patient sent away to follow this indefinitely. This was, it is true, all that was done at the start and the number of cures with this simple procedure alone was large. With many of the cases, however, very intimate study of the condition as to

gastric digestion and motility investigated by study of the gastric contents, general metabolism as studied by quantitative analyses of the urine, intestinal digestion and absorption studied by examination of the fæces, and adaptation of the treatment to the findings in these regards was necessary before success was forthcoming.

Taken all in all, however, the record is such as to confirm us in the surety that we have a method of treating constipation in a large majority of our cases which is effective and also ideal in that it follows the natural physiological method of accomplishing the function in question and does away with extraneous or drug stimulation.

ARTICLE XXXI.

THE MEDICAL TREATMENT OF GASTRIC ULCER.

By HUBERT G. WILBUR, M.D.
OF FALL RIVER.

READ JUNE 9, 1903.

THE MEDICAL TREATMENT OF GASTRIC ULCER.

PROPHYLAXIS. — From statistics obtained by Professor Welch, open ulcer of the stomach or cicatrix was found in five per cent. of persons dying from all causes. The average frequency of open ulcer was about two per cent. in persons dying from all causes. Judging from these and other post mortem records, gastric ulcer is of more frequent occurrence than is commonly supposed.

Now that so much of medical effort and energy is directed towards the prevention of disease, gastric ulcer should at least be guarded against in cases of anæmia.

It has been proven by experiments on animals, that when they were rendered anæmic gastric ulcer developed from much slighter irritation and healed more slowly than when the blood was in its normal condition.

Traumatism and localized pressure may also cause ulcer. In chlorotic females it would be wise to regulate the diet to avoid very hot things, coarse foods, highly acid and highly seasoned foods; also avoid corsets and tight clothing.

Occupation has its effect in the causation of ulcer. Seamstresses, typewriters, tailors and clerks, who lean against the machine or desk, producing pressure against the stomach, are all liable to ulcer.

Welch reports a case of ulcer in a carpenter who leaned heavily against his chisel while at work; and another case in a shoemaker who cut leather while holding it firmly against his stomach.

Hyperacidity and hypersecretion of the gastric juices, especially if they be associated with altered blood condition, demand appropriate treatment, lest they too prove to be the forerunners of gastric ulcer.

Treatment. — The diagnosis of ulcer once established by local tenderness, pain, vomiting after taking food, and hematemesis, the treatment indicated is: first, to secure rest in bed that the strength may be saved; second, to obtain absolute rest for the stomach until pain, vomiting and hemorrhage are relieved, relying on nourishment by bowel to maintain the vital force.

Pain and Vomiting. — Indigestion of food is usually attended with pain and vomiting. Food acts as an irritant to the sensory nerve at the abraded or ulcerated surface. Vomiting is also produced by the presence of food which the stomach is unable to take care of, and which it tries to eject. Food causes excessive secretion of the gastric juice, which in itself aggravates the ulcer; at the same time peristaltic action of the muscular coat is stimulated, thus increasing the liability to hemorrhage by the erosion of some of the small blood vessels. Hence pain, vomiting and hemorrhage demand absolute rest for the stomach for at least three or four days.

A case of chronic ulcer, under my observation for a period of eight years more or less, was of such peculiar interest that I may be pardoned if I briefly mention it here. The patient suffered from indigestion about all the time, but kept at his business. When I saw him at first I used lavage, with relief from pain and distress, and some improvement followed. After several months, however, the old symptoms returned, and he siphoned his stomach himself to get relief from pain and hyperacid condition. During the past three years the patient has had several attacks of vertigo, attended with a feeling of extreme weakness. Once I found him very pale, with small thready pulse,

complaining of sickness of stomach, feeling very weak, and covered with a cold perspiration; this was followed by diarrhœa, with dark tarry stools.

During one of the acute attacks, in October, 1901, I sent him to Dr. H. F. Hewes of Boston. Dr. Hewes gave him an Ewald test breakfast, after washing his stomach out. After examination of the contents, Dr. Hewes reported: acid in reaction; free hydrochloric acid present; also pepsin and renin. His diagnosis was gastroptosis, dilatation, decreased motor power, with a tendency to stasis. He suspected ulcer and possibly cancer.

The patient continued in a fair condition of health, keeping nearly his usual weight, although the condition of his stomach allowed him to take very little nourishment. His appetite was very good; anything but the simplest food, however, was followed by great distress, pain, and the formation of gases. His wife frequently siphoned out his stomach at night, because of severe pain, so that he might sleep.

In March of the present year, becoming perhaps a little more involved in business, and getting more than usually tired, his stomach refused to digest anything. The stomach was siphoned out repeatedly. At one time the result was a considerable amount of dark, granular fluid, coffee-ground in appearance; this was followed by dark tarry stools.

I was called to see him at this time, and gave ergotole m. xxx. to relieve the hemorrhage, with saline enemata and stimulants subcutaneously to sustain the pulse. On the following morning I gave a mild saline laxative to relieve acidity and cleanse the stomach of whatever of food or debris from the ulcer was there. Bismuth subnitrate in half ounce doses stirred in a glass of warm water was given once daily, with some relief of pain and fermentation. No food was allowed by mouth for three or four days. Cracked

ice was given to relieve thirst. Patient was fed by bowel. The nutrient enemata were at first egg and peptonized milk beaten well together, to which was added ʒ ii of claret. This was given about three times in the twenty-four hours. This nourishment was not retained well, and caused a good deal of distress and gas, and the subsequent cleansing enema showed that it was not well absorbed. Predigested beef and bovinine were tried, but they did not seem to be well taken up by the bowel. The patient became weaker day by day, he developed fever and mild delirium; nothing was retained, whether taken by mouth or by bowel, and he died after ten days' sickness.

A post mortem was obtained. A large ulcer, with shelving edges, about one and a quarter inches in diameter, was found near the pylorus. About one inch in towards the pylorus a scar was found, about one inch in length. Dr. Mallory examined the stomach, and pronounced it a case of simple ulcer.

If thirst be a troublesome symptom in these cases, small pieces of cracked ice may be tried or an enema of water be given. Violent pain and continued vomiting call for external applications of laudanum fomentations. A mixture of chloroform ʒ i, alcohol ʒ iii, applied on flannel will relieve pain. In obstinate vomiting I have used eighty grains of sodium bromide with ext. cannabis indica gr. ½ by enema, with excellent results. This failing, opium by suppository or morphine subcutaneously will give relief, but they should not be tried until other remedies have failed.

Feeding by the Bowel.—In most cases rectal feeding is disagreeable to the patient and liable to be irritating at first to the bowel; hence it is best to begin with comparatively small doses and at intervals of about eight hours. The tendency has been I think to give the nourishment by bowel too frequently. The usual enema is absorbed slowly; hence a sufficiently long interval between the feedings is desirable,

until we establish tolerance on the part of the colon. Once the bowel is educated up to taking food at regular intervals, then we can feed the patient for at least ten days or two weeks, until the more aggravated stomach symptoms have subsided, when we can gradually resume regular feeding by mouth. In all cases the rectum must be cleansed with one pint or more of warm salt water about an hour before each enema. We can then determine to what extent the food has been absorbed. If we find that it has not been well taken up by the bowel, it will be advisable to change to a more simple form of nourishment.

The anemic condition must be remedied by iron in some form. The ideal nutrient, then, to sustain strength and renew the impoverished blood would seem to be blood itself. We know from experiment that defibrinated blood is wholly absorbed by the bowel when given in small amounts, five or six ounces at a time. There may be some difficulty in obtaining blood, since it is not so readily accessible as the other foods.

Stewart's formula is one that should meet the condition; viz., a heaping teaspoonful of somatose is dissolved in as little water as possible; two eggs are thoroughly whipped with it; and four ounces of peptonized milk gruel added to it; the whole not to exceed eight ounces. Papain is given for the digestion of the egg. If the enema is well borne, he adds some form of the albuminate of iron (preferably Dree's), one-half to one ounce.

To combat anemia and improve the general condition, Ewald used ʒ j of a three per cent. solution of ferri chlorid in a wineglassful of egg water (one part white of egg, two parts of water), taken through a glass tube to protect the teeth. He maintains that chloride of iron is one of the best and most easily assimilable preparations that there are. With the iron he gives arsenious acid gr. 1–30 in pill form; this treatment he continues for months.

Since rectal feeding is not sufficient to sustain strength very long, we should try feeding by mouth as soon as we think it safe to do so. After two or three days' rest the stomach will admit of gradual resumption of food. Begin with very small doses of milk and lime water, a teaspoonful at a time; liquids in a predigested form; peptonized milk gruel; matzoon; and milk thickened with partially digested starchy foods, such as Nestle's, Mellin's, Malted Milk or Imperial Granum, to prevent the coagulation of the milk. If foods prepared with milk disagree, give beef juice in teaspoonful doses, either peptonized or pancreatized, or egg albumin beaten and prepared with sherry wine.

If a bland diet is tolerated, we gradually add to it broths, eggs, light puddings, sweetbreads, minced chicken and finely scraped beef, being careful to eliminate all foods likely to irritate the stomach, such as brown bread, oatmeal, coarse vegetables and fruit. As the gastric symptoms disappear we may give toast, rusks, rare roast beef and beefsteak. Any serious departure from a strict diet carefully laid down may bring about a return of the old symptoms.

Hemorrhage occurs in about fifty per cent. of all cases. In repeated and profuse hemorrhage Dreschfeld advises turpentine and considers it to give great relief. He administers it in capsules, or in emulsion ʒ ii thoroughly beaten up with the white of one egg. The dose is m.xx or xxx of the mixture.

He cites several cases of hematemesis in which the patient was pulseless and blanched to an extreme degree, in which ice, gallic acid, ergotin injections, and other styptics were tried in vain, and in which the first dose of turpentine completely stopped the hemorrhage. It is well borne by the stomach.

In case of hemorrhage with symptoms of collapse, flood the colon with hot salt solution, one drachm to the pint, and give digitalin gr. 1–30 and strychnia gr. 1–30 subcutaneously.

In case of perforation radical surgical interference is at once demanded. If the surgeon is not at hand, give morphia subcutaneously to quiet peristalsis and relieve pain, and brandy and coffee by enema to sustain the heart.

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ARTICLE XXXII.

THE SURGICAL TREATMENT OF GASTRIC ULCER.

By JOHN C. MUNRO, M.D.
OF BOSTON.

READ JUNE 9, 1903.

THE SURGICAL TREATMENT OF GASTRIC ULCER.

In accepting the flattering honor of discussing the treatment of gastric ulcer before your section, I must plead, as a partisan, for the more intimate association of the internist and the surgeon in the study of this large class of cases. What I shall say will be for the general practitioner. Without hesitation, I venture to predict that within five years my plea will be considered mild and conservative by those of you who would put me down as too radical at the present time.

In the first place, there are certain fundamental facts recognized by the surgeon, but not yet fully appreciated by the physician. An operation as performed on the average patient with a mortality so small that it may practically be disregarded, becomes serious or even unjustifiable if done in the presence of persistent hemorrhage, prolonged sepsis, starvation, absorption of ptomaines, etc. These facts are so persistently overlooked by the general practitioner that it seems worth the while to bring it up in connection with the subject of gastric ulcer. Let me, in this connection, repeat a statement that I made not long ago before one of our section meetings: that a careful analysis of over a hundred consecutive laparotomies that came to my care at the City Hospital demonstrated that at least sixty per cent. came too late from a surgical point of view. Is it fair to lay at the door of surgery all the failures, the tedious recoveries, the inevitable sequelæ, or the deaths that must obtain in such a group of cases?

In the treatment of gastric ulcer, where surgery is indicated, if we grant that in our earlier work, hesitating technique, errors in the selection of cases and in the after treatment, give discouraging or fatal results, we must not lose sight of the fact that eventually we are to look to surgery for the relief or cure of ulcers incurable by medical means, for the prevention or cure of the malignant degenerations, and for relief from the thousand and one distressing sequelæ that do not kill, but that make life worse than death.

Up to the present time surgery has by no means solved the whole question of the treatment of ulcer or its complications. There is much still to be learned before we can fairly say that a beginning has been made, but the process of learning must go on with the internist and the surgeon working conjointly, in practically all cases of ulcer or suspected ulcer. Later, when both surgeon and physician are educated sufficiently, as is the case in appendicitis for the most part, to enable each to recognize what types are medical and what are surgical, the combined observation will be demanded in a small proportion only of all cases. This is the ideal for which we must strive.

Without hesitation I would agree that the majority of cases are medical theoretically from first to last. To determine where the line should be drawn in the remainder, demands a most careful and persistent collaborated study in all cases of ulcer, at least for awhile.

It is not my purpose to quote statistics. One can safely state that the results, as regards mortality, from operation, are improving almost month by month. If we take the published reports of the operators of largest experience, like Mikulicz, Robson, Mayo, Moynihan and others, we find that both their immediate and remote results are far better than the results as given by internists. And yet, these surgeons, of large and selected experience, recognize

the limitation, appreciate the failures, and are as conservative in their judgment as one could wish. Through it all, and in spite of failures, the one great fact remains that ulcer of the stomach is more and more becoming a disease to be treated by the surgeon, not late but early, not as a last resort, but before the starvation, the long suffering from pain, dyspepsia and fermentation-absorption have reduced the patient until he is beyond surgical help; before he is anæmic from persistent bleeding or peritonitic from culpable delay.

A discussion of the technique that so interests the surgical world has no place here. Each advance means more lives saved. Much of the complicated technique could be eliminated were it possible to give the surgeon his cases when he wishes and not when the physician is compelled. No one but a surgeon especially interested can keep pace with the phenominal advance in this line, always for the better, within the last three years.

Compare the oft-quoted statement of Greenough and Joslin, that "Every other patient with gastric ulcer that one sees in the hospital is either to have a recurrence or never to be well again," with the results of the hundreds of cases reported by the various surgeons mentioned above. One must thereby be convinced of the value of surgery in this class of cases.

Another plea that I would make is for the internist in the present transitory stage of stomach surgery, to found his pathological knowledge on living as well as upon post mortem dissection. In other words, let him see in the living that which the surgeon sees, and correct his views by these findings, not relying entirely on the limited knowledge obtained at the autopsy. Let me illustrate by a parallel example. A number of years ago, when there had been but one or two interval appendectomies in this neighborhood, I ventured to remove an appendix from a

patient who had suffered for a long time from colics and indigestion. The appendix appeared normal, and one of our most eminent pathologists, who had obtained his knowledge entirely from post mortem findings, scored me severely for performing a meddlesome, unjustifiable operation. I will venture to say that within the last year there have been thousands of operations under similar conditions, failure to perform which would now be considered unjustifiable.

Are the present methods of diagnosis by chemical analysis of any value? I am sure that at least three-fourths of such diagnoses are of no practical value, when it comes to cases that would be classed as surgical by a surgeon. In my own limited experience the analyses have been interesting but much less reliable than general clinical data. The important thing for the patient and the surgeon is not to know that there is an ulcer, but to know that that ulcer is doing harm where it is situated; whether single or multiple (though that is of less importance); whether the ulcer symptoms may or may not be due to adhesions; what contractions there are consequent upon its healing; whether the base of the ulcer is already undergoing malignant degeneration; whether the ulcer is on one side or the other of the pylorus; whether the next hemorrhage may not be fatal, as I have seen so many times, comparatively, in ulcers medically treated. In other words, the internist may or may not be able to state that there is an ulcer; beyond that he cannot go. To determine whether there is a condition amenable to medical treatment he must experiment to a certain extent. If he succeeds, well and good; if he fails he must be willing to seek the coöperation of the surgeon, or better, he should have sought it early in order that both should study the case, and both should learn, each from the other's findings.

I will quote an oft repeated statement by Mikulicz who has had unusual and very great experience. He says: "The

danger to life from gastric ulcer is at least not less, but probably far greater, than the danger of a complete modern operation." It is fair to say that gastric surgery has so rapidly progressed since that was written that the application is still more pertinent.

What cases are medical and what are surgical? No hard and fast line will be drawn for years to come. Many patients with first attacks, without serious hemorrhage, who can give up the time, and who realize the importance of prolonged rest as so well emphasized by Shattuck, will recover permanetly under medical treatment, but the following types are best considered as surgical: Probable cases of relapsing acute hemorrhage. Cases with hemorrhage if persistent and causing anæmia. Perforation. Recurrent ulcer, pure and simple, attended with dyspepsia and starvation. Pyloric obstruction. Adhesions following ulcer or independent of it. Scar contraction of the body of the stomach. Some cases of intractible dyspepsia, perhaps originating in an ulcer, and for which no definite pathology is known.

Let us consider each of these types a little in detail. In relapsing hemorrhage various surgeons are already obtaining satisfactory results from a simple gastro-enterostomy.

In chronic hemorrhage, although all surgeons realize the imperfection in their results, that is, occasional relapses, operative deaths, jejunal ulcers, etc., yet the benefits are so much better than from medical treatment, and the improvement in results is so steadily and surely advancing, that I have no hesitation in placing this type in the surgical list.

In perforation no one will deny the wisdom of early operation, and yet, in this city, there are physicians still, who allow the first twelve hours to slip by before they summon surgical advice, unable or unwilling to make a diagnosis, and thus reduce the patient's chances of recovery from

seventy in a hundred to practically nothing. Is there any valid excuse for this?

In cases of simple ulcer with dyspepsia and starvation, surgery has a wide field before it; far wider, I venture to predict, than medicine. Let me read that most graphic description of Moynihan's, published in the last issue of the Boston Medical and Surgical Journal (June 4th, 1903): "There are few beings so abjectly miserable as those who are the victims of intractible dyspepsia. The mealtime, which should be a delight, is a time of despair and foreboding. The keen relish of good food, which the man in physical health should appreciate, is a joy unknown or long forgotten to the dyspeptic. A patient who has misery written in every wrinkle of a thin and haggard face, who by reason of long suffering and bitter experience, has felt compelled to abandon first one dish and then another, till fluids alone can be taken, and these not always with impunity, a patient, to say the truth, whose whole life becomes embittered by the pangs of a suffering which he must inflict upon himself, this patient will find if a gastro-enterostomy be done for the chronic ulcer, which is the source of all his trouble, that his return to health and appetite is at first almost beyond belief."

In cases of pyloric obstruction we have a purely mechanical problem with which to deal. No amount of medicine can overcome this condition, and no amount of argument by the internist can convince the surgeon that such cases are best treated medically.

Cases of adhesions from chronic ulcer, gall-bladder disease, appendicitis, etc., cannot be accurately diagnosticated without the aid of surgery, and very few of them can be relieved without operation.

Cases of beginning malignant degeneration cannot and probably never will be diagnosticated *in time* by the internist. What surgeon ventures to definitely say that a

chronic mastitis is or is not starting a malignant focus? Even the pathologist may have to examine hundreds of sections. How much less likely are we able without operation to make a similar diagnosis in a chronic ulcer, situated we know not where in the stomach, of whose size and condition we are absolutely ignorant, and of whose actual presence we may be unaware.

In gastric neuroses of uncertain origin, but with a history of ulcer, many mistakes will be made by the surgeon. This class needs much study by specialists in all branches, but undoubtedly in a small proportion, on the theory of chances, surgery will be of some benefit.

In conclusion, I would urge a more intimate coöperation of the physician and surgeon in the observation of patients with ulcer of the stomach. The surgeon must willingly grant that a majority of simple ulcers are best treated and cured by the internist, but on the other hand, the latter must as willingly consider surgical advice in the obstinate or serious types of cases, and learn in the living a pathology that it is impossible to learn in any other way.

DISCUSSION.

Dr. E. P. Joslin, of Boston: Six cases of ulcer of the stomach treated surgically have come under my observation. The reports of the cases are as follows:

Case 1. Miss E. F., 44, was seen March 7, 1902. Entered Boston City Hospital, September 11, 1901. For the three years previous, dyspepsia. In March, 1900, vomited six oz. blood. Winter, 1900–1901, pain in epigastrium, which increased during the summer. Ewald test breakfast, September, 1901, showed 50 c.c. or 0.18% hydrochloric acid. Hæmin crystals.

September 19, 1901, Gastro-enterostomy.

A pale, indurated, round area the size of a silver dollar was observed, which was situated midway on the lesser curvature upon the anterior wall.

Oct. 1. Phlebitis in left leg. Discharged Oct. 28.

March 7, 1902. Cramp-like pain in region of stomach. Pale and rather thin. Fasting stomach showed lower border at navel and no tumor. It contained 12 c.c. slightly greenish fluid. No free hydrochloric acid. Total acidity, five. Mucus. Many leucocytes and a few red blood corpuscles. Died of cancer of the stomach, May, 1903.

Case 2. Miss K. M., 51, was seen for the first time Oct. 21, 1902. Digestion never strong. In July, 1901, vomited, almost for the first time in her life, at midnight and again on the street five days later. Three days after this was strong enough to ride a bicycle from Buffalo to Niagara. Since this time has had vomiting spells every month until four weeks ago a vomiting spell lasting for two days. This was repeated four days and three days ago. In the last attack the quantity was two quarts and some of it was dark brown. Weight in 1893, 160; one year ago 143, now 123. Examination showed a fairly nourished woman with good color. Pulse 76.

Stomach—upper border two c.m. below ensiform, lower at navel. No tenderness. Fasting stomach contained 240 c.c. coffee ground material. Free hydrochloric acid present.

Oct. 22 to Nov. 18, steady improvement, but on this day vomited. Free hydrochloric acid 0.1%. Total acidity 0.15%. The stomach was washed out Nov. 19, 20, 22, at which time the patient was taking but little under the normal quantity of food, but the second improvement did not continue. Several mild attacks of tetany occurred. On Nov. 29, Dr. Pfaff concurred in the diagnosis of ulcer and in advising operation. A gastro-enterostomy was done with an enterostomy by a Murphy button. At the operation the surgeon erroneously supposed that there was a cancer at the pylorus. Circular vomiting ensued and lasted till the death of the patient sixteen days later, Nov. 16, 1902. Tetany did not reappear after the operation.

Autopsy.—Dr Hoag, of the Boston City Hospital.

Gastro-Intestinal Tract. Mucosa of the posterior wall of the stomach is finely mottled by many conspicuous red points

usually less than 1 m.m. in diameter. Pylorus normal. One c.m. below pylorus, upon the posterior surface of the duodenum, there lies an oval ulcer 1 c.m. x 6m.m., entirely perforating the coats of the duodenum; margin, narrow, firm, inelastic, level and gray. The duodenum at this point is nearly occluded, admitting but the tip of the little finger. The margins of the ulceration are lightly attached to the anterior surface of the head of the pancreas so that no leakage occurs posteriorly.

The orifice of the gastro-jejunal anastomosis admits the tips of two fingers, and is bounded by a slightly elevated margin, unaccompanied by injection or other inflammatory sign. There is free communication between the two arms of the jejunal loop at the gastric opening. The second anastomosis, jejuno-jejunal, is perfectly patent and patulous, easily admitting the finger. Thus, the anastomoses are perfect; no lack of infection is evident.

Case 3. Mr. M., 62. First visit April 30, 1902. For 30 years pain in the epigastrium with heartburn. For one year has vomited frequently, and daily since April 26, two quarts at a time. Three weeks ago hemorrhage from the bowels sufficient to cause fainting. Alcoholic history. Vomitus—Free hydrochloric acid .16%. Total acidity 0.32%. Sarcinæ. Examination showed fair color. Weight one year ago 160; April 30 about 135. Lower border of stomach at navel.

May 12. No improvement under diet and lavage. Diagnosis—gastric ulcer and dilatation of the stomach. "Surgeon said in the consultation that he had never had a more favorable case for operation."

May 14. Operation.

May 15. Death with distended abdomen. Autopsy absolutely refused.

Case 4. Miss S. D., 27, gave the following history on Oct. 24, 1902. Always had had stomach trouble. Vomiting from seven years to four years ago. March 18, 1898, vomited a hand basin full of blood and this was repeated on the following day notwithstanding that she had lived on milk for the preceding three months. July 6, 1898, perforation of the ulcer and emergency operation in the country

which was completed in August of the same year at the Boston City Hospital.

Jan., 1901, vomited one half a cup full of blood, and on April 5, 1902, one half as much more, at both of which times she returned to the hospital for an ulcer cure. Appetite good. Weight, 1896, 98; April 27, 1903, 121. Occasional attacks of vomiting and pain after eating, similar to the pain before the perforation five years ago. Diet is extremely simple. At present is a telephone operator.

Case 5. Mr. H. D. S., 31, consulted me March 4, 1901. Stomach always has been his weak point. In the early part of December, 1900, began to have faintness between meals with pain and hunger, and since that time has vomited on six occasions. Best weight, 157: weight today 151. Hemoglobin 80%. Pulse good. Splashing in abdomen easily obtained, but the stomach distended with air was 1-3 c. m. above the navel though 3 c. m. below the ensiform. Ewald test breakfast. 90 c. c. Free hydrochloric acid present. 10 c. c. blood.

March 7, entered the Deaconess Hospital and underwent a typical ulcer cure. During the first week several severe hemorrhages, but by April 20 had improved so much as to be allowed to convalesce out of town. Weight 118½.

May 2. Hemoglobin 80%. Weight 134½. Patient evidently was eating too much, though of simple food, and the diet was curtailed.

May 9. Weight 138.

May 11. Vomited blood and was sent to the Boston City Hospital where he underwent a second ulcer cure, but at the end of a few weeks again vomited blood. Operation on June 15. Excision of an ulcer which partially narrowed the pylorus. Convalescence was slow but steady and patient resumed work in nine months. June 24, 1903. Reports himself very well.

Case 6. Mr. A. H. H., 59, was seen May 30, 1903. His father was a chronic dyspeptic, vomited for fifty years and died at 80. The patient has had for three years distress and gnawing pain in the stomach which has been relieved by food and soda. In Oct., 1902, gave up work. Since October he has frequently vomited and on a few occasions food which was eaten two days previously has

been recognized in the vomitus. As a rule the vomiting has been voluntary. The patient has drunk large quantities of water and washed out the stomach in this manner. Involuntary vomiting has occurred only within a few days. On the morning of May 30th the patient vomited nearly two quarts of coffee ground material which contained free hydrochloric acid. Total acidity 74. No lactic acid. Sarcinæ present. Weight two and one-half years ago, 228; weight one year ago, 206; weight four months ago, 155; at present time about 135 lbs. Color fair. Pulse 78 and of fair quality. No tumor felt in the stomach. Two days after the first hemorrhage, another occurred. On the following day Dr. Pfaff, for whom I had made the single visit, saw the patient and advised operation which was performed the next morning, June 3. An ulcer was found near the pylorus which was nearly occluded by the inflamed mucous membrane. Gastro-enterostomy. To-day, June 9, uninterrupted recovery.*

SUMMARY AND RESULTS.

Case 1. Hemorrhage. Gastro-enterostomy. Recovery from operation. Death twenty months later from cancer, which probably existed at the time of operation.

Case 2. Hemorrhage and Dilatation. Gastro-enterostomy. Entero-enterostomy. Death with circular vomiting sixteen days after operation.

Case 3. Hemorrhage and Dilatation. Gastro-enterostomy. Entero-enterostomy. Death within thirty-six hours.

Case 4. Operation for perforation. Recovery. Two subsequent attacks of hematemesis in following five years. Patient able to do light work, but has indigestion.

Case 5. Hemorrhage and Dilatation. Excision of ulcer. Recovery, and is well two years after operation.

Case 6. Hemorrhage and Dilatation. Gastro-enterostomy. Recovery. (Operation June 3, 1903). Died July, 1903. Colloid cancer.

Excluding the first case, the mortality in these five operations is forty per cent. Of three patients who recovered

* Patient died July, 1903. Colloid cancer of pylorus.

from the operation, one has had two relapses in five years, one has remained well two years and one is doing well fourteen days after operation.

If ulcer of the stomach is to be operated upon successfully in Boston, a change must take place in present methods. There is an abundance of good surgeons, but few have had extensive experience in stomach surgery. In a ball game the members of the team always play their respective positions, but the surgical nines in our large hospitals play in any position that offers and the substitutes do the same. It is to be expected that each surgeon will have a number of failures while acquiring experience. When it is remembered that there are thirty or more surgeons, any one of whom may be called upon to operate upon ulcer of the stomach, the number of individuals destined to be offered up on the altar of experience becomes rather appalling. Until some agreement is reached whereby stomach surgery is limited to a few men, better statistics are not to be anticipated.

Dr. F. M. Sherman, of Newton: I find myself, for the most part, in accord with the reader of the last paper. His advice that the physician and surgeon co-operate in the treatment and in the study of these cases seems to me timely, because I believe that the knowledge to be gained in the future through surgical experience will decide many of the questions now open concerning gastric ulcer.

The definite and positive opinions I have formed on the treatment of this affection are, *First:* That the majority of cases properly belong to the domain of medicine rather than of surgery. *Second:* That the best medical treatment is that long ago recommended by Wilson Fox and by Foster, which is rest in bed, no food by the mouth, and rectal alimentation. If water is freely supplied most patients can stand a lot of starvation. In addition, water made alkaline with bicarbonate of soda may be administered, with the idea of diminishing the acidity of the gastric juice and irrigating the ulcer with a bland and slightly antiseptic fluid. Favorable results sometimes follow this treatment, even when imperfectly carried out; but the gravity of the affection is enough to warrant its rigid enforcement, and under it I think we may expect many patients to recover, and to recover more quickly and

more easily than under any other treatment. *Third:* Nevertheless, in spite of any medical treatment, there will be a certain proportion of cases not benefited. These cases should be offered surgical treatment, not only because of the suffering, the disability and the ever present dangers of hemorrhage and of perforation, but also because of the possible grave sequelæ, those, for example, resulting from perigastric adhesions, caused by a local peritonitis, over the ulcer, or that very serious condition, cancerous change at the seat of the ulcer, which many believe to be common. *Fourth:* Cases of dangerous hemorrhage from gastric ulcer should have surgical treatment. *Fifth:* In case of perforation, surgical intervention is imperative, and the sooner the better. Early operation here offers a good chance for success.

Dr. J. H. Jackson, of Fall River: I can add but little to the evidence as to the seriousness of the diseases discussed, or to the methods of forwarding recovery. The papers have been wholly admirable and it is difficult to add to them. There may be some little things which may be of interest.

One thing I think has not been emphasized sufficiently, although it has been touched upon by four or five of the speakers and writers: the absolute necessity, in ulcer of the stomach, of rendering not only the stomach and bowels less acid but the condition of the blood less acid. Though we must consider the method of attack of acids, upon the stomach, whether pepsin or hydrochloric acid, or anything which attacks the stomach and causes the ulcer, these are secondary causes; behind them as a primary cause is lack of alkalinity of the blood, which promotes the condition favoring ulcer. Were the blood more alkaline, the acids would destroy the tissues less. Were it more in the condition of normal alkaline blood, it would not permit the peculiar provocative elements which attack the whole of the stomach; ruptured capillaries, embolism, infarctions and blood clot would be impossible. Hence the necessity of some addition to the blood to prevent the conditions which may induce the ulcer. If these conditions exist before the ulcer forms, they certainly exist in an accentuated degree after the formation of the ulcer. If acidity exists, why must we not overcome the tendency by methods that have been so well suggested in the discussions that have taken place? I feel sure that

these things lie behind the condition which produces the ulcer. The ulcer is the cause of other troubles, coming out of its deep delving among the coats of the stomach, even puncturing them and causing adhesions.

Very little has been said about adhesions. Here comes in, if you have ascertained adhesions (as you may by various methods of physical examination) and a distended stomach, this question: What can we expect from medicine to establish a permanent cure? We may do much temporarily, and our patient recovers temporarily, with the remaining condition of a stomach which induces a recurrence of the trouble. Here comes in the need of the surgeon. These operations promise a great deal more in the future than is suggested by past statistics. By all means, welcome the surgeon early in these cases.

As to the treatment I have only a few words to say. All the things spoken of in the preceding papers and discussions need to be thought of in connection with it. The medical man is simply the one who meets the emergency for the time being, and if he is a wise man he will call in a surgeon, and he and the surgeon will lay their heads together, that they may accomplish the return of the patient to health.

In a distended stomach, with adhesions and an ulcer in it, with a band running around its middle, making of the stomach an hour-glass or conical, with an ulcer an inch long—if the pressure of food is aggravating this, what can pills and powders do that will permanently stop the hemorrhage? Welcome all efforts for cure of the disease by medicine, but by all means, hand over the case in adhesions, stretching and dragging on the pylorus, or distension of the stomach, to the surgeon. Let us add to our medical treatment that of the surgeon.

ARTICLE XXXIII.

HYPERCHLORHYDRIA.

By ROSCOE W. SWAN, M.D.
OF WORCESTER.

READ JUNE 9, 1903.

HYPERCHLORHYDRIA.

A FAIRLY constant set of symptoms appear in about one-half of all stomach cases. They might be described in the following manner:

Usually persons from fifteen to forty years of age; in all walks of life; well-to-do, and otherwise; no respect to position or social standing; but constant sufferers.

They will tell you that after eating a meal, say from one to three hours or more, they have a sensation of fulness in the epigastrium, with pains radiating through to the back and extending to the region of the heart, or extending over the abdomen. Oftentimes they have a burning sensation which is accompanied by eructations of a warm fluid rising in the mouth and called water-brash, or is accompanied by expulsions of a foul smelling gas which has a choking sensation in the throat. If this gas does not make its appearance through the gullet, it remains long enough to produce marked distention of the stomach as well as acute colicky pain in the intestines.

After these conditions have lasted for months, and many different remedies have been tried without results by as many different physicians, the patient becomes very irritable, despondent, and even melancholy. Headaches appear, mostly hemicranial and periodic, leaving as abruptly as they begin, only to return shortly. The memory is poor, to-

gether with insomnia and depression. They round out a set of symptoms similar to neurasthenia, or marked anæmia occurs. The appetite is almost always good and the weight is not changed. There is usually intense thirst, and the urine is free and frequent, is slightly acid in reaction, is deficient in chlorides, and indican is increased. But at times the acid is diminished, and this diminution of acid in the urine during digestion is a rough measure of the increase of H Cl in the gastric juice. Often times there is nausea, with vomiting, preceded and followed by tenderness over the epigastrium.

At the time when the stomach is empty these patients are free from pain. The ingestion of food and drink almost immediately gives relief to the symptoms for a short time. These symptoms generally end with the evacuation of the stomach.

The bowels are usually sluggish.

All of these conditions correspond to a disease known and described as Hyperchlorhydria, which has been spoken of so often of late that many different views are expressed about its supposed origin, and as many more about its course and treatment.

Many of these symptoms may arise directly from the stomach, or reflexly from the central nervous system, which in these cases suffers intensely at times through the absorption of toxines from the stomach.

Some authors deny the existence of persistent disorders of secretion which are not produced by an anatomical lesion of the gastric mucosa, and the majority of writers consider all the dynamic affections of secretion to be neuroses. No one will deny that secretion may be disturbed through the nerves which control it. Prolonged study and careful investigation have led to the conclusion that disorders of secretion are not always due to an alteration of the mucosa or to a neurosis of the vago-sympathetic system.

The normal stomach does not secrete when it is empty, and at most only 10 to 20 c.c. of gastric contents can be removed when the tube is introduced into the normal stomach in the early morning before breakfast, but sometimes when the stomach tube is introduced at this time it will be found to contain more than 20 c.c. of a liquid rich in H Cl and the digestive ferments.

When a figure of acidity of 70 is reached after an Ewald's test breakfast, there is always present a hyperchlorhydria.

Hyperchlorhydria denotes a pathological increase of the H Cl in the filtrate of the gastric contents at the acme of digestion.

The causes of hyperchlorhydria are those common to a large number of other diseases of the stomach and are as often found in the constitution and temperament as in the mode of life and the alimentation.

The abuses of condiments, the eating of large quantities of red meat, and imperfect mastication, are common causes. It is most frequent in the arthritic and the neuropath, in neurasthenia, hysteria, and in melancholia. It is quite frequently associated with intestinal autointoxication. It is common in colilithiasis and renal lithiasis, in chlorosis and in nicotine poisoning and malaria.

Mental and moral causes play an important part. Cerebral fatigue may mark the beginning of the trouble and illustrates the close relations existing between the brain and the abdominal sympathetic.

The trouble may begin immediately after a particular meal, or it may, and generally is, more gradually developed after a meal composed of starches, cereals, sweets, vegetables, fruits and fats, causing discomfort and pain at the height of gastric digestion.

The diagnosis of hyperchlorhydria can be frequently made by the existing subjective symptoms; discomfort or

pain appearing one or two hours after meals, and alleviated by the ingestion of food or alkalies, speaks most prominently in favor of this condition. The diagnosis, however, is only a probable one, not yet positive. In order to make it decisive it is necessary to examine the gastric juice at the height of digestion. If too great acidity (caused by H Cl) is found and the just mentioned subjective symptoms prevail, the diagnosis of hyperchlorhydria is positive. The figure of acidity is one and one-half, sometimes double or three times as large as normal, the normal H Cl being from one-tenth to two-tenths per cent.

The microscope and chemical examination of the stomach contents after a test breakfast give us the most conclusive evidence as to existing conditions.

The examination of the blood is of great aid in drawing conclusions which will enable us to apply successful treatment to hyperchlorhydria. While all modes of research as to the pathological condition are important, the blood examinations are the most interesting if not the most important.

The differential diagnosis in spite of the clear cut features of the disease may present some difficulties, and in some cases only a probable decision can be made.

Dyspepsia of liquids with supersecretion presents a very similar group of symptoms. The objective signs can alone differentiate the two diseases.

Displacements of the stomach may manifest the same subjective symptoms. The pain, however, is peristaltic, and due to the stomach trying to overcome the pyloric obstruction. Is not removed by albuminous food, and milk may be badly borne. The physical and functional signs make the differentiation clear.

Hyperchlorhydria may be easily confounded with ulcer. H Cl is not always in excess in gastric ulcer, although it may be a predisposing cause, and when doubt exists an

ulcer cure should be prescribed. A hemorrhage large or small would exclude the functional trouble. Pain in ulcer is not relieved by taking albumen food. Otherwise the functional and subjective signs may be almost the same. The pain is increased by movements, and may be relieved by rest in a particular position.

Hyperasthenic gastritis resembles hyperchlorhydria even more closely than does ulcer. The gastritis is more directly traceable to diet and alcoholism.

The contents of the gastric juice after a test meal contains a large quantity of mucus and cell nuclei.

The signs differ only in degree and not in kind.

The prognosis is generally good; there are but few cases which resist all kinds of treatment, and for these in most instances complications (either some organic lesion of the stomach or of the central nervous system) must be looked for. In very old people an unfavorable prognosis must sometimes be given, as when the symptoms point to a malignant disease.

The diet for hyperchlorhydria is yet a subject of great controversy. Some clinicians forbid starchy foods entirely, and nourish their patients principally upon an animal diet. Their reason for forbidding the starches is that the amylolysis in hyperacidity is greatly diminished, the acid checking the conversion of starch into sugar quite early.

There is, on the other hand, quite a number of well known clinicians who forbid meats to patients with hyperchlorhydria on account of their property to produce an increased flow of gastric juice. They prefer a milk diet and the carbohydrates.

On account of the variety of opinions advanced one is justified in recommending the diet giving the best results, and in my own cases I prefer a mixed diet of a predominance of albumens and sparingly of the starchy food. Sweets increase the quantity but diminish the acidity of

the gastric juice, and in moderate quantity are beneficial. Spices, condiments, acids, oils and alcoholic drinks should be absolutely prohibited.

The treatment consists in checking an excessive flow of gastric juice: and first among the remedies used is the extract of belladona or its alkaloid atropin. In the experiments carried out the amount of H Cl was diminished from one-third to one-half the normal amount. The tendency which H Cl has for combining with the different alkalies when brought in contact, suggests the proper ones to use in hyperchlorhydria, *i. e.*, calcined magnesia combines with nearly twice its weight of H Cl, and bicarbonate of soda combines with less than half its own weight.

The best of results are obtained by combining magnesia and soda in such proportions as the urgency of the case requires, increasing or diminishing the magnesia as the bowels are confined or loose. Carlsbad salts reduce the amount of H Cl, especially when prolonged over a period of four weeks at a fashionable health resort. Nitrate of silver in dose of 1–1000 by means of the intragastric spray gives fine results.

Lavage of the stomach will relieve the pain of a stubborn cramp in the region of the pylorus, there being nothing to do but to wash away the strong irritating acids. This is best followed by the intragastric spray of nitrate of silver.

It should not be overlooked, however, that there may be a chronic gastritis with a normal or an excess of acid. Here the alkalies are to be preferred to the salines, and should be administered warm.

Constipation will, as a rule, be relieved by the alkalies as soon as they neutralize the acidity. Then the carbohydrates to be digested pass through and stimulate the bowels to act. Rhubarb and soda, or large injections of say 8 oz. of olive oil; change of habitation from country to seashore will overcome the cause. Massage of abdomen is followed by good results.

Hydrotherapy may be tried to suppress mental irritation. A cold sponge bath followed by brisk massage will accomplish much toward quieting the nerves.

As every organ is strengthened by activity and weakened by lack of exercise, one cannot urge too strongly the importance of diminishing the amount and number of artificial digestives employed in hyperchlorhydria.

ARTICLES XXXIV–XXXVI.

PRIVILEGED COMMUNICATIONS.

PRIVILEGED MEDICAL COMMUNICATIONS.

By DAVID W. CHEEVER, M.D.
OF BOSTON.

THE WORKINGS OF THE NEW YORK LAW.

By WALTER SOREN, Esq.
OF BROOKLINE.

PRIVILEGED COMMUNICATIONS TO PHYSICIANS.

By FREDERICK J. STIMSON, Esq.
OF DEDHAM.

READ JUNE 10, 1903.

ARTICLE XXXIV.

PRIVILEGED MEDICAL COMMUNICATIONS.

By DAVID W. CHEEVER, M.D.
OF BOSTON.

In a court of justice a communication is called privileged if the witness may legally refuse to divulge it; or where he may be protected or sustained by the court, if he declines to answer. Such are the statements or revelations of a prisoner to his legal counsel.

A privileged medical communication would be one made by a patient to his physician.

The Roman law protected the physician. And among Latin countries France made it a penal offence for the physician to disclose the confidence of his patient. But the English common law, so lenient to the accused in most respects, assumes another position in regard to medical witnesses, and obliges them to answer, or be held in contempt of court, and subject to imprisonment.

"The highest legal authorities in England have decided that medical men enjoy no special privilege with regard to secrets of a professional nature."

"In other words, no practitioner can claim exemption from answering a question because the answer may or would involve a violation of secrecy, or even implicate the character of his patient."*

* Prof. Tidy.

The law of Massachusetts follows the English law. To quote an authority: "Neither is protection extended to medical persons in regard to information they have acquired confidentially by attending in their professional characters."*

Again: "By the common law of Massachusetts the physician is obliged to state publicly, on the witness stand, whatever may have been told him by his patient, even although involving character or family secrets."

Every New England State has the same law; so, also, Alabama, Delaware, Florida, Georgia, Mississippi, North Carolina, New Jersey, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, W. Virginia.

New York, however, follows the Latin precedent, and goes even farther, as follows: "No person duly authorized to practise physic and surgery, shall be allowed to disclose any information which he acquired in attending a patient in a professional capacity, and which was necessary to enable him to act in that capacity."

A similar law governs priests and attorneys. The New York law was subsequently amended so as to allow a physician to testify, in cases of wills, as to the mental or physical condition of the deceased, except confidential communications, and such as might disgrace the memory of the patient. The following states have adopted similar laws: Arkansas, California, Colorado, North and South Dakota, Idaho, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, Ohio, Oklahoma, Oregon, Utah, Washington, Wisconsin, Wyoming.

Eighteen states copy Massachusetts. Twenty-two states follow New York.

The remaining states we are unable, just now, to determine.

Such is the law. What are the evils?

Indiscretion, weakness, fear, sin, all seek the family physician as a father confessor. He holds the honor of the

* Greenleaf on Evidence.

patient and the character and social standing of families in his hands. He knows what no other knows; and he often knows what is unknown in the family itself. In every relation of human life the doctor holds, and holds sacred, the secret history of many families; and carries to the grave with him knowledge which would revolutionize the life of whole communities.

The mischief of telling is so much greater than the mischief of concealing, that the simplest principle of expediency should forbid the revelation. Every instinct of honor, propriety, decency, is arrayed against it.

Hippocrates laid an obligation on his students that nothing heard in the sick room should ever go outside it. The wisdom of former ages is only confirmed by the experience of to-day.

Does any one doubt it? Even judges and lawyers acknowledge its force. Says an English judge, "If a medical man were voluntarily to reveal these secrets, to be sure, he would be guilty of a breach of honor and of a great indiscretion; but in a court of justice medical men are bound to reveal secrets, when required to do so."

Said a Massachusetts lawyer to an unwilling medical witness, before the trial, "you shall have plenty of room to kick!"

Public opinion, not to consider professional opinion, would revile and contemn the man who betrayed confidence. Such opinion says, "you must not tell" The law says, "it may be dishonorable, but you have got to tell." Can any position be more false and more cruel for the honorable man?

I quote the London *Lancet* of May 9, 1896, on the Playfair case. "Never was the question of professional etiquette more forcibly presented. There is no written code to guide the practitioner." "There are [things] which it would be subversive to every moral rule to divulge; there

are those which it is his bounden duty to disclose. It is a safe formula that, unless there are overpowering reasons to the contrary, a patient's secret should be held inviolable by his medical adviser, almost, if not quite as binding as the Confessional of the Roman Catholic Church. When it involves the commission of crime, morality and justice require the breaking of a confidence." Says Taylor's Medical Jurisprudence, edition of 1897 : — "The safer rule for the physician is never, under any circumstances, to reveal the confidence of his patient, and to preserve inviolate any secret obtained in the course of his professional practice."

The doctor in a court of law is in a false position—false in proportion to his sense of honor. Some would go to prison rather than betray a confidence—some would consider (and so say the judges), that the law absolved them. The law should recognize the rights of the patient, the duties of the medical man, and the justice due the community.

How can these difficulties be reconciled? We propose the following for consideration:

It shall be considered unprofessional for a physician to divulge anything confided to him by a patient, unless:

1. With the patient's consent.
2. To defend himself when accused.
3. To expose crime.

In all other cases, such professional confidences shall be classed as "privileged communications." It shall be a question of honor whether the physician shall feel it his duty to repeat such a "privileged communication"; if he conscientiously declines, he shall be protected; if he testifies, it shall be before a judge, in private.

ARTICLE XXXV.

THE WORKINGS OF THE NEW YORK LAW.

By WALTER SOREN, Esq.
OF BROOKLINE.

The original form of the New York law in regard to confidential communications between physician and patient (passed at least as early as 1836) is as follows: "A person, duly authorized to practice physic or surgery, shall not be allowed to disclose any information which he acquired in attending a patient, in a professional capacity, and which was necessary to enable him to act in that capacity."

The best way to treat the subject, is to illustrate as well as possible by citing cases, how the New York courts have construed the most important points in this statute.

In its practical application the statute has been considered as passed solely for the protection of the patient, and has been construed somewhat liberally in his favor. Under recent amendments allowing the privilege of secrecy to be waived by the patient or his heirs, no other parties can be allowed to take advantage of the statute if the proper waiver has been made.

Another practical point is that a party at a trial wishing to take advantage of the statute, must claim the privilege, and show that he is entitled to it, as soon as the objectionable question has been put. If he waits to see whether the answer is favorable to him or not, it is then too late to object in any form.

Theoretically I shall invite your attention to only three points in this statute which have been passed upon by the higher courts of appeal:

I. What shall be considered to constitute the relation of physician and patient?

II. In any given case, what shall be considered as information "acquired in attending a patient"?

III. What information shall be considered as "necessary" to enable the physician to act as such?

Instead of trying to give a complete answer to any of these questions in abstract form, it has seemed more in accord with the general idea of this paper, to cite a number of cases on each point, and thus afford a good opportunity for the formation of individual opinion as to the working of the law. The cases from "N. Y." reports are of undoubted authority. Those from Hun and "State" reports, are the decisions of inferior courts, but are in accordance with the principles laid down by the higher court, and are believed to be good law. Each case should be considered with particular reference to the point under which it is cited, as it has not been fully considered or reported with reference to such other points in it as may seem important on general principles.

The cases are also arranged as nearly as possible with reference to their closeness of application.

First, those referring to the relation of physician and patient:—

At the trial of an action involving the validity of a certain will,[1] it appeared that a short time before the execution of the will and the testator's death, the attending physician called another physician who attended in consultation as to the testator's condition and treatment. One of the parties called the consulting physician as a witness, and desired to show by his testimony whether the testator was in a conscious or unconscious condition when examined by him.

It was decided that the relation of physician and patient arose here, under the circumstances, even though the patient might not have known or recognized the consulting physician, and that the consulting physician therefore could not testify as to the condition in which he found the patient.

On an inquisition as to sanity by a jury before commissioners,[2] held some time after the patient had been set free from an asylum, evidence was offered of the opinion of certain physicians who had treated him at the asylum, as to his condition when he left. On objection being made on behalf to the patient, it was decided that these physicians could not give their opinion as requested, inasmuch as it was necessarily based upon facts observed while treating him professionally.

At the trial of an action against a life-insurance company,[3] to recover the amount of the policy, the defence was that the insured had made a false statement in his application, as to the health of a brother. It appeared that a month before the application was made, a physician had examined the brother's physical condition at the request of the brother's employer who received the physician's report and paid him his fee. The physician told the employer that the man was not well enough to continue in business; and also told the brother that he was hopelessly ill, but did not prescribe for the case or give any advice as to its treatment, or have any further connection with it. It was decided, however, that the physician could not be allowed to testify as to the results of the examination; as the patient was entitled to the privilege of secrecy on properly submitting himself to a physical examination, whether or not it was for his own benefit, or at his own expense.

At the trial of an action against a railroad company to recover damages for personal injuries received in an accident,[4] the defendant called as a witness a doctor (usually employed by it as an expert) who testified that some two

weeks after the accident, the attending physician of the plaintiff brought the latter to the office of the witness and asked him to examine the plaintiff and see what was the matter with him. He testified that he made an examination and among other things examined the ribs. He was then asked the question "Did you find any fractured rib"? It was decided that this might be answered inasmuch as it was not shown that the witness was requested or expected to treat or prescribe, or to advise respecting treatment, or that he did either.

In a case where the sanity of a person on trial for murder was drawn in question,[5] it appeared that certain physicians had been sent to the jail by the district attorney to make an examination of the prisoner's mental and physical condition. It was decided that they might properly testify as to their opinion of the prisoner's mental condition merely, as they saw him in the cell and in the court-room, but could not testify as to any statements that he made or as to his physical condition.

These cases are sufficient to bring out the most important of the points involved in the first question.

It will be desirable here to mention the following amendment, passed in 1893: "In an action for the recovery of damages for a personal injury, the testimony of a physician or surgeon attached to any hospital, dispensary, or other charitable institution, as to information which he acquired in attending a patient in a professional capacity at such hospital, dispensary, or charitable institution," shall be taken before a referee, but the court may in its discretion summon him as a witness.

No case has been found involving this amendment, but it does not seem to contain any points of obscurity. Since this amendment was passed, one or two cases have been decided in which it might have had some application, but it does not appear to have been taken into account. However, they are of interest on the general subject.

The question arose in one case at the trial of an action brought by a minor against a street railway,[6] to recover damages for personal injuries received in an accident. The defendant's counsel called as a witness a physician who testified that he went with the hospital ambulance to take charge of the plaintiff at the time of the accident, and on the way to the hospital asked him various questions as to how the accident happened, etc.,[7] all however in compliance with the rules of the hospital as to his conduct in the treatment of patients. The court decided that the witness might properly state what the plaintiff said to him as to how the accident happened.

Three justices dissented to this opinion, very properly calling attention to the point that the witness distinctly asserted that whatever information he acquired from the patient was in reference to his condition and for the purpose of prescribing for him.

In a somewhat similar case,[8] the physician who attended in the ambulance came to the patient's room in the hospital some ten days after the accident and asked him some questions as to how it happened. The trial judge said "I think the doctor came there with the assumed authority that a doctor would have in such a place, and the communication was privileged."[9] However, it was decided that the relation of physician and patient did not appear under the circumstances to exist in any such sense as to bring the case within the privilege of the statute.

In this case the patient was a child only six or seven years old, and it would seem, under the circumstances, as if the trial judge took the most sensible view. In both the above cases, however, the result would probably have been the same if the amendment had been used.

II.

The second point is on the question of what, in any given case, shall be considered as information acquired in attending a patient:

On the trial of an action in which the physical condition of a certain person during the last year of his life became material,[10] a physician was called as a witness who testified that he had attended the decedent professionally during the year 1879, and the first few months of 1880. At that time the professional relation ceased, but from then on it appeared that the witness often saw the patient informally, and observed his condition in that way until the patient died in November, 1881.

It was decided that the physician might testify as to the patient's condition as it appeared from observations of outward visible facts, open to the sight of any person, and seen by him on occasions when not attending in a professional capacity.

The next case is one showing the beginning of the exercise of some ingenuity in avoiding the effect of the statute:

In an action to recover the amount of a life-insurance policy,[11] a question arose on a warranty in the application as to the health of a brother of the insured. A physician who had attended the brother professionally, and whose whole knowledge of the case was acquired at one interview, was called as a witness by the defence. Of course his testimony as to the results of his examination was inadmissible, but he was asked this question: "What opinion did you form of the case, based on the general sight of the man before you made an examination, or before you had any conversation with him?" It was decided that this question was not admissible, although it related to facts observed by the physician without the necessity or aid of any confidential disclosure, or any physical examination. It was enough

that the observation was permitted to the witness in his character of physician, and in the due and proper exercise of his calling.

The next case presented an excellent opportunity for the exercise of some ingenuity in evading the operation of the statute, but it was not fully taken advantage of:

At the trial of a case involving the validity of a certain will,[12] where the testamentary capacity of the maker was drawn in question, a physician was called as a witness who had attended the deceased in a professional capacity, and also for a considerable period as a friend, and not professionally. It appeared from the preliminary questions, however, that the impressions he acquired on the friendly visits necessarily related back to, and were influenced by, the knowledge he acquired during his professional visits. Of course it was decided that he could not be allowed to testify.

The next two cases, however, seem to have been prepared with great skill:

At the trial of a case in which the validity of a certain deed was drawn in question,[13] a physician was called to testify as to the mental condition of one Eliza Fisher at or about the time when she executed the deed. It appeared that he had attended her professionally, and had also seen her at various times when he was not in attendance for the purpose of treating her professionally. He was asked various questions as to her mental condition, and requested at the same time to exclude from his mind, in answering, any knowledge or information which he had acquired as to her condition while attending her professionally; and to confine his answers to such knowledge and information as he had obtained of her by seeing her when she was not his patient. Of course the questions were all objected to, but it was decided that they might be answered; because they were so framed as to exclude evidence being given of impressions

obtained while the witness was attending his patient in a professional capacity.

At the trial of an indictment for murder,[14] the prosecution called as a witness the physician of the jail where the prisoner had been confined for the preceding six months, and proceeded to ascertain his opinion of the mental condition of the prisoner at the time the murder was committed, by putting certain hypothetical questions based upon symptoms which had appeared before the prisoner came to the jail, and which had been observed and testified to by other witnesses. The witness was requested, in answering, not to allow his actual knowledge of the case to influence his opinion, and replied that it was impossible to do this entirely. As the question was in proper form, however, he was allowed to answer, making what effort he could to comply with the requirements of the question.

It is no more than fair to call attention to the facts that this was a criminal case, and also that the relation of physician and patient here was official only. If it had been a civil case the rule would probably have been applied in the same way as in the "Darragh" case just cited.

The foregoing cases give some idea as to what the statute means by the relation of physician and patient; and what information is considered as acquired "while attending the patient."

It remains to examine the point as to what information is considered "necessary" to enable the physician to act as such (and therefore privileged).

Here, more than in the other two points, there has been difference of opinion between the higher and lower courts, and also some change in the general opinion since the statute was enacted. It is a good example, too, of how the operation of a statute may be modified and directed by judicial construction. The cases cited will show that while the word "necessary" has received a somewhat broad con-

struction, it is not extended to include in any way matters not directly relating to the patient's mental or physical condition.

The first two are cases where the facts in dispute could not have any effect upon the professional conduct of the practitioner, and were not facts regarding the condition of the patient.

III.

WHAT KIND OF INFORMATION SHALL BE CONSIDERED NECESSARY.

At the trial of an action against a railroad company to recover damages for injuries received in an accident,[15] the defendant called the attending physician and asked him this question: "Did the plaintiff state to you on the day when you first called on him, that he did not observe the train until he was struck?" This question was objected to, but the court decided that in such a case, nothing the patient could say in regard to his observation of the train could have been either material or useful to the physician in his treatment, and therefore the question might properly be answered.

In another similar case,[16] it was held that the physician who attended a person injured in an accident at a railroad crossing might testify to the statements of his patient of means taken to warn him of the approaching train, and which he did not observe until it was too late.

The next two cases deal with facts relating somewhat to the patient's condition:

At the trial of an action against a mutual benefit association to recover the amount of the policy,[17] it appeared that the deceased had, about a month before he died, in order to get reinstated as a member, made a certificate to the effect that he was in good health. The sole defence to the action was that the certificate was untrue.

It was decided that the physician who attended the insured in his last illness might testify as to the number of calls he made on the deceased, the dates of the calls, and that the patient was sick, and thus contradict the certificate without disclosing any information intended to be protected by the statute.

At the trial of an action against a railroad[18] to recover damages for personal injuries sustained in an accident, the defendant called as a witness a physician who testified that the day after the accident the plaintiff called and consulted him. He was then asked if he conversed with her and made an examination of her with regard to her injuries. It was urged in support of this question that it did not appear to call for the disclosure of any information that was necessary to enable the witness to act in a professional capacity. But the court said that the inevitable inference was that the information given to the physician by the patient, whether it related to her injuries or not, would not have been imparted, except to aid the witness in prescribing, and, therefore, under a liberal construction of the statute, the witness could not state the particular injury as to which the plaintiff consulted him. It will easily be appreciated, too, that the question could not have been answered either yes or no, without disclosing the fact as to whether the patient was then suffering from her injuries to such an extent as to require treatment.

At the trial of an action brought by a woman against a town to recover damages for personal injuries received by falling on a defective side-walk,[19] the plaintiff claimed, and offered evidence to show, that among other severe and serious injuries caused solely by the accident, was an umbilical hernia. The defendant then called the plaintiff's family physician, as a witness, and he testified that he had attended the plaintiff in a case of child-birth about a year before the accident. At this point the plaintiff's attorney objected, and

it appeared that the defendant was about to prove by the witness that the hernia complained of had existed before the accident happened. It was claimed that if the physician discovered the hernia while treating the patient, but did not treat her for it, and the knowledge of its existence was not necessary to enable him to give the treatment he did, he ought to be allowed to testify in regard to it.

The court decided however, that the witness could not be allowed to testify in regard to the hernia, because the very nature of his employment compelled its disclosure to him, and in this sense, the information he acquired as to its existence was "necessary."

It would not be very easy to sum up the result of these and many other cases that might be found in regard to this third point, but it may be put pretty accurately, as follows:

Information acquired by a physician in his professional capacity shall be considered necessary to enable him to act, whenever it relates to the patient's mental or physical condition, whether acquired by direct examination or incidentally, and whether or not the condition so observed be the particular subject of treatment either at that or at any other time.

HOW THE STATUTE MAY BE WAIVED.

After the statute in its original form, had been on the books some forty or fifty years, and had worked a great deal of injustice because anyone could take advantage of it, the brilliant idea occurred to somebody, that as the law was made entirely for the benefit and protection of the patient, it would be no more than fair to allow him to waive it when its operation would work him a great injustice. Accordingly, in 1877 an amendment was made, allowing the patient to waive the privilege.

In about fifteen years more, some one conceived the equally brilliant idea for equally obvious reasons, that it would be

no more than fair to allow the patient's heirs to waive the privilege, so that the entire amendment now stands substantially in the following form (including in its application two other sections as to clergymen and lawyers).

"The last three sections apply to any examination of a person as a witness unless the provisions thereof are expressly waived by the person confessing, the patient, or the client. But a physician or surgeon may upon a trial or examination, disclose any information as to the mental or physical condition of a patient who is deceased, which he acquired in attending such patient professionally, except confidential communications and such facts as would tend to disgrace the memory of the patient when the provisions of sec. 834 have been expressly waived . . . by the personal representatives of the deceased patient, or (if the validity of the . . will . . . of such . . patient is in question), by the executor . . . named in the will, or the surviving husband, widow, or any heir at law or next of kin of such deceased, or any other party in interest."

This amendment had a salutary effect, in preventing the working of great hardship in many cases where a waiver of the privilege was desirable for the benefit of the patient or of his estate.

But the life-insurance companies (who had suffered in some of the cases already cited, and of course in many others), were not slow to adopt the plan of putting into all their printed applications, a concise but complete waiver of the privilege of the statute, on behalf of the insured or his heirs, and all persons claiming under them.

This gave rise to an amendment in 1899 to the effect that the waiver may only be made in open court or by agreement of counsel before trial. However, the waiver so made, need not be in any particular form, but may be made by merely calling the physician as a witness, and asking him the necessary questions.

It is evident of course, by this, that it is possible to waive the statute by the conduct of the case in court.

Before calling your attention to a few cases where this has been done somewhat unintentionally, I am going to add to the statement that the statute is solely for the benefit of the patient the corollary that it it is not for the protection of criminals. This has been indicated also in one or two of the cases mentioned in the first part of this paper.

It has accordingly been held that in a case where a waiver by the patient or his heirs had become impossible, a physician who had attended the patient might give evidence of facts observed by him tending to show that a crime had been committed, and to which ordinarily, without such waiver, he could not be allowed to testify.

But it is no doubt true, that if the patient or his heirs were accessible and capable of waiving the privilege, such waiver would have to be made, even in a criminal case, before any evidence could be introduced of any information ordinarily privileged.

The remaining cases to be cited show how the privilege of the statute may be waived at the trial by estoppel as it were, and are therefore instructive. It will be seen from these, as from some of the cases cited under II. that, naturally enough, attempts are constantly made on behalf of the patient, to get the benefit at the trial of the facts constituting the privileged information; and then by the exercise of the privilege, prevent the other side from introducing any evidence in regard to them.

About the time of the commencement of an action against a railway company for injuries sustained in an accident,[20] two physicians attended the plaintiff for the purpose of ascertaining the extent and nature of her injuries. At the trial the plaintiff called one of them as a witness (waiving the privilege of the statute as to him) and he gave important testimony tending to show that the plaintiff was affected

with some spinal trouble as the result of the accident. This opinion was based mainly upon the result of the examination which he had made together with his associate on the occasion referred to. Both had attended together, and made a physical examination with special reference to the existence of some disease of the spine as a result of the accident.

When the defence came to putting in their case they wanted to call the other attending physician and allow him to state his opinion. The plaintiff objected to this, but the court held that in such a case the waiver of the privilege as to one consulting physician extended to the whole consultation, and the other physician might properly be called upon to state his opinion. The court in this case took occasion to state as a general rule that

"Where a full disclosure is made with the consent of the patient, the reasons upon which the statute was founded no longer exist, and every party to the transaction thus disclosed is relieved from any injunction of secrecy."

At the trial of an action against a railroad to recover damages for personal injuries received in an accident,[21] the plaintiff called the physician who had attended at the time of the accident and he testified as to the nature of the injuries. It appeared that three physicians had attended the case but all at different times, one after another. The defendant then wished to call the other two attending physicians as witnesses, but it was decided that by calling the first physician the plaintiff had only waived the privilege as to him and as to the case as it was when he saw it. But the privilege was not thereby waived as to the subsequent condition of the case and the two physicians called by the defendant could not therefore testify as to the condition of the case when they saw it.

At the trial of an action of tort for personal injuries,[22] the plaintiff came on the stand and testified that the defen-

dant shot him in the arm with a rifle and that "Dr. Venner came and put a plaster on it."

The defendant testified that he only struck the plaintiff a blow with the rifle, and wished to substantiate this evidence by calling Dr. Venner to testify what his opinion was, at the time when he attended, as to the nature of the wound, claiming that the plaintiff, by his testimony, had waived the privilege, having disclosed and brought in issue the facts as to the nature of the wound. It was decided however, that the plaintiff had not gone far enough by stating his own observation of the case to waive his privilege of preventing the attending physician from stating his opinion as to the nature of the injury.

It seems pretty evident that so far as can be judged from the records of decided cases, that the working of the New York law of privileged communications between physician and patient is a little hard on life and accident insurance companies.

It does not seem to have much effect now in contests over questions of testamentary capacity, as anyone interested in the estate can waive it.

Nor is it of great service in itself in preventing the disclosure of matters not intimately connected with the physical or mental condition of the patient. This has arisen however mainly from the interpretation of the New York court as to what information shall be considered "necessary."

The defence of accident cases is of course much assisted by the amendment allowing hospital physicians and surgeons to testify, and there has also been since 1893 a provision of the code that where an action to recover damages for personal injuries is brought, or expected to be brought, and the case is a proper one for requiring the plaintiff's deposition to be taken, on the plaintiff's motion a judge may before trial order a physical examination to be made at the same time the deposition is taken. The report of the phy-

sicians or surgeons making such examination however, must be made to the court, and they cannot be allowed to testify at the trial as to any information acquired at the examination.[23]

Of course this provision cannot be used except in a very few cases, but it is mentioned here for the sake of completeness.

Under the late amendments, the privilege cannot be waived after the death of the patient as to confidential communications and such facts as would tend to disgrace his memory. Unfortunately this amendment has not been fully passed upon, so that it can only be conjectured in the light of previous decisions, whether the court would decide that "confidential communications" were such only, as related to the patient's mental or physical condition.

Before closing, I will call your attention to one more case which illustrates several of the principles already noticed.

A workman employed in a quarry was accidentally struck with a piece of iron on the left side in the region of of the heart.[24] The wound was superficial, but quite severe, and he was carried to his home, where he died a week afterwards. He had been carrying an accident policy, but the company refused to pay, and the widow brought an action to recover the amount of the policy. At the trial the plaintiff's attorney proved by the testimony of the widow and one or two nurses, what symptoms had appeared in the case between the time of the accident and the time of the patient's death.

He then called four physicians who had never seen the case at all, and asked them certain hypothetical questions, based upon the evidence which had already been given as to the condition and symptoms of the deceased. These experts all testified that in their opinion the death of the insured was the direct result of being struck by the piece of iron.

The defendant did not cross-examine them at all, but proceeded to call four other physicians and qualified them as experts.

It turned out from the preliminary questions that the last four were the family physician who had attended the case, and three others who had been called in for assistance and consultation. To each of these, hypothetical questions were put involving the same facts as those put to the plaintiff's experts, but in the following form: "Doctor, please exclude from your mind any knowledge or information you acquired in attending this case professionally, and suppose you were called to see a man suffering from a wound in his side such as has been described in this case, and found also that he had something of a cough, with an occasional spitting of blood, and delirium in the night time; and suppose he died in about a week, while those symptoms continued, what would you say was the cause of his death?" At this the plaintiff's counsel objected; but the court said he had disclosed all the facts himself, so that the answers of the defendant's experts would not tend to disclose any information prohibited by the statute, and they might answer, and the fact that they really knew something about the case *would only affect the weight of their testimony*. With this permission the defendant's experts proceeded to answer the questions, and all testified that in their opinion the patient died of typhoid fever.

Since this paper was delivered an article has appeared in a journal circulated among the medical profession, calling attention to a case in another jurisdiction under a similar law, where manifest injustice was done to a physician who appeared as the defendant in a suit for mal-practice. According to the principles contained in the cases above cited, it seems pretty clear that under the New York law the plaintiff in a suit for mal-practice would have to prove and thereby disclose so much in regard to his physical condition

as to practically waive the privilege of the statute on any matters of importance to the defendant's case.

The obvious lesson to be drawn from the working of the New York law so far as I have been able to show it, is that any new legislation on the subject of privileged communications would have to be contained in eight or nine separate sections in order to take advantage of the points which have made the amendments to the New York law advisable. It would also be well to avoid if possible, language giving the court such entire freedom of construction as the word "necessary," which was passed upon in most of the cases cited under III. It is not intended to make this paper controversial, and perhaps an apology should be made for the remarks about the mal-practice case. It is of course evident that cases of injustice will arise both with and without such a law as prevails in New York. If a new law as to Privileged Communications is wanted, the question is whether such a law could be framed which prevented more injustice than it caused.

It has often been said that the well-known "Statute of Frauds" did not meet this requirement, yet it is still almost everywhere in force. The fact that they are still amending the New York law, instead of repealing it, is a point in its favor. However, the main question is intended to be left open for the present, for further debate under such light as may be derived from this and other more bountiful sources.

CASES CITED.

1. Renihan v. Dennin, 103 N. Y. 577 (1886).
2. 11 State R., 263 (1887).
3. Grattan v. L. I. Co., 24 Hun. 43 (1881).
4. Henry, v. R. R., 57 Hun. 76 (1890).
5. People v. Kemmler, 119 N. Y. 585 (1890).
6. Green v. Met. St. R'way Co., 171 N. Y. 201 (1902).
7. Accident in 1897.
8. Griffiths v. Met. St. R'way Co., 171 N. Y. 106 (1902)
9. Accident in 1899.
10. Burley v. Barnhard, 9 State Rep. 587 (1887).
11. Grattan v. L. I. Co., 92 N. Y. 274 (1883).

12. Re. will Catherine Darragh, 52 Hun. 591 (1889).
13. Fisher v. Fisher, 129 N. Y. 654 (1892).
14. People v. Schuyler, 106 N. Y. 298 (1887).
15. De Jong v. R. R., 60 N. Y. Supp. 125 (1899).
16. Brown v. R. R., 45 Hun. 439 (1887).
17. Patten v. L. I. Co., 133 N. Y. 450 (1892).
18. Feeney v. R. R. Co., 116 N. Y. 375 (1889).
19. Nelson v. Oneida, 156 N. Y. 219 (1898).
20. Morris v. Ry Co., 148 N. Y. 88 (1895).
21. Hope v. R. R., 40 Hun. 438 (1886); 110. N. Y. 643.
22. Dunckle v. McAllister, 74 N. Y. Supp. 902 (1902).
23. Lyon v. Manhattan Railway, 142 N. Y. 298 (1894).
24. Meyer v. Accident Co., 40 N. Y. Supp. 419 (1896).

ARTICLE XXXVI.

PRIVILEGED COMMUNICATIONS TO PHYSICIANS.

By FREDERICK J. STIMSON, Esq.
OF DEDHAM.

It was a matter of regret to me that an accident prevented my having the honor of speaking for my profession upon this subject at the annual meeting of The Massachusetts Medical Association; but I have now the advantage of the discussion upon it made by Dr. Cheever and Mr. Soren. I have advisedly changed the title, for the reason that "Privileged Medical Communications" seems to imply that the statutes protecting such are limited to matters medical alone, whereas at least under some laws, such is not the case.

The papers read at the meeting, as well as the discussion in the Boston Medical and Surgical Journal which preceded it, had the valuable result at least of clearing the ground. Probably in the minds of both professions, medical and law, there was considerable haze upon this subject. Many of us had a vague idea that communications *were* privileged when made to a physician in the course of his attendance. This undoubtedly arose from the fact that all judges, under the English common law system of procedure, are clothed with very considerable discretion in their conduct of examinations, particularly cross-examinations, of all witnesses. This discretion is so great that, particularly in states

where there is no statute, the judges shape the law. For instance, in Massachusetts, which is among those conservative states still following the common law and rejecting codes, there is, I believe, no instance where a priest has been compelled to divulge the secrets of the confessional. Yet the priest is no more protected by any statutory provision than is the physician. This leads me to the chief of the contribution that I have to make upon the subject: that the question is really, in one of its principal aspects, hinged upon the dispute, with which we lawyers are so familiar, as to the relative advantages of *codes*, — that is, statements of the law or of the common law more or less complete, made by newly drawn up statutory codes, which intend at least, to be exhaustive,—and the "common law" system, which accepts the English common law as it is, crystalized through a thousand years of court decisions in England and this country, and rarely attempts a new statute, still less a statute which is merely expressive of the common law. The lawyers of this country are still divided on this cardinal point into two schools, and the same is true of the state legislative systems. The older states, particularly those of English origin, stick to the common law, and never attempt to define it, rarely even to improve it by statute. The newer states, especially those where the codes prepared by the late David W. Field have been seriously considered, adopt the other view. The "common law" states are Massachusetts and the New England states, Pennsylvania and the middle states except New York, and the Southern states generally, with one or two notable exceptions, such as Georgia, where they have a code which aims to be so complete as to exclude the necessity of referring to the common law at all. The Field codes of substantive law were generally adopted only in California, and the far western states following her lead, but the Field code of *procedure* was also adopted in New York, and there has been

a tendency to codification in New York since. I do not propose here to go into the argument between the two schools. The obvious view of the young western lawyer, who has not generally had a college education, and lives in a town possibly remote from libraries, is that it would be convenient to find all the law in the statutes. We are told in the early lives of Abraham Lincoln that one of the two or three books that he first read and almost learned by heart, was a volume of the revised statutes of Indiana — somewhat dry reading, we should think, to-day. The reply to this argument by the common law believers is that the effect of a code is to wipe out all the certainty that we have gained from past history, and to lose the benefit of the infinite number of adjudged cases where the law was decided in the absence of a statute and where, even now, no statute could possibly be drawn which would apply. Under the common law most cases, after all, have been the subject of judicial decision. Moreover the vagueness of the discretion left to the judge is possibly of advantage. Under the code system, nothing is certain that is not in the code. No discretion to be strict or to be lenient can possibly be allowed the judge; and until every sentence, every word, every punctuation mark, has been the subject of a court decision, we cannot be certain of what the law is.

Thus it happens that in this matter of privileged communications there has been under the common law very great discretion exercised by the judges, extending, as I have said, in the case of priests at least, to a complete privilege, and probably in the case of physicians, to a very considerable protection. This protection is given, it is true, at the court's discretion; but is the more adjustible to the reason of each case by that very fact; and at least one thing is clear, — that if we are to have a statute on the subject, that statute must necessarily be a rod of iron. It must apply to all cases equally; and nothing on the one side of the line

can be allowed and nothing on the other side can be excluded. No one, for instance, contends that the privilege of physicians should be extended to cloak crime, and yet it is extremely probable that, if the statute were passed, there might be some other cases where the admission of a physician's testimony would be for the public advantage; and on the other hand, even when the privilege is extended in civil matters only, it should certainly not go so far as to prevent a physician from testifying as to the mental condition of a deceased testator in a contest over a will.

In short, I believe that the general question will be largely determined, at least by lawyers, according as they believe or do not believe in general statutory codes.

Coming now to the concrete matters. It is clear, as I have said, that the following points are fairly established: first, the lawyer at common law has a privilege, the physician and priest have not; second, the privilege should rarely, if ever, be extended to criminal cases; third, the privilege exists for the benefit of the patient or client, and not for that of the physician or lawyer. There are other points which are very uncertain, at least in states where they have a statute upon the subject, *e. g.* whether the privilege extends to actual communications or also to matters of observation which fell under the notice of the physician while occupying the relation of medical adviser to the patient; whether the patient must, in fact, have employed the physician or have known that he was so employed; whether and under what circumstances the privilege may be waived.

The statutes, in so far as they have been adopted, fall also into several classes. According to the latest text book on the subject, that of Mr. Arthur M. Taylor of New York, they have not been adopted in New England and the middle states, except New York and Pennsylvania; but the Pennsylvania statute is very moderate, applying only to civil cases; in the South they have been adopted only by

North Carolina; but in the middle West they have been adopted by all the states except Illinois; in the states west of the Missouri River by all the states and territories except New Mexico, — twenty-five states and territories in all have a statute, but the tendency, even in these states, is not always consistently in favor of a professional privilege to physicians. Minnesota has recently adopted, and Michigan proposed, most extraordinary statutes, one providing that no physician shall, in matrimonial causes, be protected from testifying as to the existence of a sexual disease, and the other (which, however, failed for the moment to pass), providing that no one could get married without a certificate of his family physician that he or she was free from epilepsy, consumption or sexual diseases generally, and that in no such case should the doctor have any privilege whatever. It is also important to notice that the statutes very generally apply only to licensed physicians or surgeons, though, as we know, the tendency to license persons not regular physicians, — osteopathists or Christian Science people, — is very largely increasing in the more radical states. Generally the privilege only applies to such information as was necessary to enable the physician or surgeon to act in his professional capacity. Such is the New York statute, but a court of Pennsylvania, notwithstanding its statute did not go nearly so far as that of New York, made a very sensible decision that matters outside such professional information, when confided to the doctor by the patient, especially in answer to the doctor's questions, were also privileged — a most excellent example, by the way, of the advantage of the common law over the code; the Pennsylvania court, having no code law upon this point, could make such a decision, while a New York court could not. Generally the statute reads that a physician shall not *be allowed* to disclose such information, but in some states it is only that he shall not be compelled, and in most states, as I have said before, it may

be waived, not by the physician, but by the patient, or party to the suit. The restriction of the privilege to civil cases exists in only a few states having the statute. In my opinion the wisest law of all is that of North Carolina which, while creating the privilege, says that the presiding judge may compel disclosure of knowledge professionally obtained, etc., if in his opinion the same is necessary to a proper administration of justice. Practically, this is the common law.

The relation of physician and patient must, of course, exist. The mere fact that a man is a physician confers no privilege, but it is usually immaterial whether the physician was called or employed by the patient or by someone else. A physician who goes really to get evidence, not employed by the patient, although he may give some professional treatment, commonly acquires no privilege, especially when the physician is wholly paid by a third party. One physician may, however, call in another and impart to him the privilege. In Ohio, Indiana and in other states the statute extends to all matters observed by the physician, although not confided to him by the patient or not necessarily matters relating to the treatment. For instance, in Arkansas where an unmarried woman told her physician that the father of her child had not promised to marry her, the communication was not held to be privileged, as it had nothing to do with her professional treatment. This rule is usually in opposition to the statute contended for by Dr. Cheever, which protects only the disclosure of any matters tending to cast disgrace upon the person treated. A physician was not required, in Missouri, to state that his patient was drunk when he called upon him for professional services. In no case is there any privilege in suits by the patient against the physician for malpractice.

Let us now consider the usual cases in which the question of the physician's privilege arises. These are:—(1)

criminal cases where the patient is the criminal; (2) criminal cases where the patient is not the criminal but the person injured; (3) actions for damages for personal injuries by the patient; (4) will contests; (5) actions by the beneficiary of insurance policies; (6) suits between physician and patient. Let us leave the question of statute or common law, but consider, broadly stated and in popular language, how we should like the law to be in each of these classes of cases.

First; criminal cases where the patient is the criminal. I can see no reason, nor do I believe that the medical profession will differ from me, to use the physician's privilege to protect crime. We all recognize the ethical duty of the physician not to tell. No one claims that he should run to the nearest police officer; but these considerations are matters of professional honor and there they may well be left. When the patient, long after he is well, is actually apprehended and brought into court on a charge of murder, or even assault, it is clear that the highest interests of the state require that the physician's knowledge should not be used to cloak the crime. Certainly that is true in cases of murder, but in the lighter cases—take the example of assault and battery—it is pretty clear that a man who is seriously injured will not risk his life by failing to consult a physician when the punishment for the crime itself is so slight. And for the extreme example, does anyone claim that the doctor who set the leg of John Wilkes Booth, after the murder of Abraham Lincoln, should have been prohibited from testifying to the facts? Was he not in fact sentenced for life because he did not reveal the fact?

Second; Criminal cases where the patient is not the criminal but the person injured. In this case there seems no reason whatever why the physician's testimony should not be required.

Third; Actions for damages for personal injuries by the

patient. This is perhaps the only case subject to any doubt, but after all, why should the patient be protected? If his injury is really trivial and the person injured intends to maintain a fraudulent claim for large damages, there does not seem much injustice in the end in making him go to a physician at his own risk. Moreover, it is always to be remembered that it is difficult for him to refuse seeing a physician sent by the defendant. If, on the other hand, the person is seriously injured he will certainly go to a physician and that physician will certainly testify to his benefit. In fact, experience shows that physicians, perhaps properly, are more than ready to testify on their patient's side of the case.

Fourth; Will contests: In this case it is perfectly clear that there should be no privilege. To begin with, the patient is dead. Even in New York there has been a desire and an attempt by the courts to alter the law in this particular, so that a physician may only not be required to testify, after the decease of his patient, to anything bringing disgrace upon him or his family. But the matters which result in the annulment of wills are not usually those which bring disgrace upon the patient or his family, except where that disgrace is richly deserved. Wills are rarely affected by the physical condition of the patient. They are either affected by outside conditions or by the patient's mental condition, which is surely proper matter of evidence.

Fifth: Actions by the beneficiaries of insurance policies: All life insurance companies now require the applicant for a policy to see their own physician, but under the New York statute even he is prohibited from testifying. There might be some reason for this on the ground of estoppel; if he allows the applicant to get a policy, he could logically be prevented from saying that he ought not to have had a policy; but as a matter of fact, it is well known that the New York statute, in effect, works a fraud upon life insur-

ance companies, and if the family physician knows that the policy holder is subject to an incurable disease and, notwithstanding, he gets a life policy by concealment of that fact, under what ethical principle is the physician not to testify after his death, thus making a fraud effectual?

Sixth: Suits between physician and patient. Under the common law there is no privilege in suits for malpractice, while suits by a physician for his fee are somewhat rare in the higher orders of the profession. Certainly it is not for the interest of the physician, at least, to have the privilege maintained in this latter case.

Finally, there is a great class of cases, likely more and more to get into the courts, in matters of marriage, divorce or sometimes wills, where the physical condition and the just or temperate life of some person is concerned. I have not made a definite class of these, for the reason that they might come in almost any of the divisions above set forth. Probably we all know cases where the testimony of the physician has been of great importance, as in matters of justifiable breach of promise. Those wishing to go into the subject may refer to a very able article by Professor Huberich of the University of Texas, in a recent number of the Harvard Law Review; but these are all peculiar cases where the discretion of the judge, acting under the wise liberality of the common law, may be relied upon to protect both the patient and the physician. No statute can be drawn which may be safely applied to such delicate matters, short of the absolute exclusion of all testimony by physicians in all cases. I have said enough to show that in my opinion this, at least, is unwise.

My own conclusion is, therefore, both that in most cases the common law stands right, and that it is wiser in all to leave the whole matter to the common law. A significant argument for this is shown in the very fact that Mr. Soren has found it necessary to fill some twenty pages with an

account of cases where it has been necessary for the supreme tribunal of New York to decide what the statute meant. All these are the consequences of the adoption of a statute. During the same period very few such cases have troubled the courts of Massachusetts and the courts of New England; for under the common law the rule is in most cases clear. And there has recently been a distinct check to the tendency to adopt statutes upon this subject. I find that, while some twenty or twenty-five states copied, as they usually do, the statute of New York when it was adopted, since 1891 there has been no statute in any state of the United States except the very reasonable one already mentioned in Pennsylvania, and an extraordinary statute in Iowa which absolutely prohibits physicians from disclosing any communications given in professional confidence, and which applies as well to stenographers or confidential clerks. Indeed it may be doubted whether the reasons for such a statute do not apply as well to the case, for instance, of a confidential clerk, or a trustee, as of a physician.

The reason of the privilege given the lawyer rests on quite a different basis. One goes to him for the express purpose of being defended in the courts. We all know that the ethical position of the lawyer defending a person known to him to be a criminal has been a commonplace of debate for centuries. Nevertheless, it is generally accepted now, if only on the broad ground that it is by no means easy always to tell whether a man is a criminal or not, and that, even if he be a criminal, he is entitled to counsel, if only for the purpose of determining the degree or grade of his offence. This, therefore, is a mere rule of the game in the courts. But a criminal does not, in the ordinary course of events, have to go to a physician; and in ninety-nine cases out of a hundred what the physician testifies to is of momentous consequence, civil and criminal, and often no other person can be conversant with the facts.

If any statute is adopted I should recommend a combination of the laws of Pennsylvania and North Carolina; that is, adopt the Pennsylvania principle that the privilege extends only to civil cases, and this with the exception of the competency of persons making a will, and the very luminous phraseology of the North Carolina statute which substantially states the common law, that is, it allows the judge to determine when the communication by physicians of knowledge acquired while attending the patient is necessary for a proper administration of justice.

Many legal abuses have grown up and many bad decisions have been rendered in this country, I regret to say, from the plain ignorance, that is, the absence of historical legal education, on the part of the judges. Notably this has been true in the great human interests affecting labor and capital, and those recent combinations commonly known as trusts. Two great evils, — the election of ignorant judges and the clothing of petty courts with high chancery powers, — have largely been responsible for the abuse known as government by injunction and the objectionable powers of trusts; and it is more than probable that, in matters of evidence, many judges have rudely compelled the disclosure of professional secrets, which in no sense really pertain to the necessary administration of justice. This is, indeed, one of the arguments for the code, that it brings to the notice even of an unlettered judge more principles of the common law than he might otherwise be familiar with; but for Massachusetts, at least, in this matter of privileged communications, I should prefer to rest, as we now do, upon the definiteness and the elasticity of the common law, the good sense of the judges and the honor of the medical profession.

ARTICLE XXXVII.

THE ANNUAL DISCOURSE.

SOME FERMENTATIONS IN MEDICAL EDUCATION.

By HAROLD C. ERNST, M.D.
OF BOSTON.

DELIVERED JUNE 8, 1904.

NOTE.—At an Adjourned Meeting of The Massachusetts Medical Society, held Oct. 3, 1860, it was

Resolved, "That The Massachusetts Medical Society hereby declares that it does not consider itself as having endorsed or censured the opinions in former published Annual Discourses, nor will it hold itself responsible for any opinions or sentiments advanced in any future similar discourses."

Resolved, "That the Committee on Publications be directed to print a statement to that effect at the commencement of each Annual Discourse which may hereafter be published."

SOME FERMENTATIONS IN MEDICAL EDUCATION.

Mr. President and Fellows
of The Massachusetts Medical Society:—

In looking up the history of the office I am honored in attempting to fill to-day, certain points of interest have been brought to my attention.

In 1804, Dr. Isaac Rand delivered the first Annual Address—on Phthisis Pulmonalis, and the use of the warm bath—and with six exceptions (1814, 1815, 1819, 1825, 1831, 1832) the practice has been continued annually, until to-day it enters upon the second century of its existence.

The subjects considered in this long line of addresses cover, as might be supposed, a wide range, and it is interesting to note a gradual change that has occurred. About twenty per cent. (19 out of 95) have been upon what may be called "specific" lines of thought—such as the first one (mentioned above) or those of Abraham Haskell (1812) on Cynanche Trachealis, Walter Channing (1833) on Irritable Uterus, or Horatio Adams (1858), Investigations upon the subject of Vaccination. Such specific subjects were, however, very largely treated more than fifty years ago (17 out of 19), and in the last half century the speakers upon this occasion have usually considered matters of general interest to the profession in a long series of entertaining essays.

Evidently the matter of education has been much in the minds of medical men, for nearly half of the addresses during this latter period have had this for the major, or a prominent minor theme. Indeed it was first treated specifically in 1822, by Dr. John G. Coffin, (On Medical Education and on the Medical Profession), but the somewhat marked increase of attention given to it of late years, shows how actively the specific fermentations of advanced thought have been producing changes and by-products with which we shall have to deal.

The men who have brought these matters before the Society command attention by the honorable position they have held in the ranks of the profession, and the list includes many of the names most familiar to us of to-day as being among the leaders of medical thought in the past.

It has been, therefore, with many misgivings that I have endeavored to prepare myself to say something that has not been said and better said before.

Without thought that this latter is possible, it may be well to consider some of the changes—fermentations—going on in medicine, now, as in all previous stages of its history. To see what elements of good have come, and perhaps to forecast some of what may be hoped for when the end results are reached.

One of the most impressive incidents in a recent trip abroad, occurred in Paris upon the occasion of a visit to the Institute Pasteur. The spirit of the place is present everywhere—the spirit of earnest search for some addition to human knowledge, for some alleviation of human suffering, inculcated in all his pupils by the master mind of the founder.

This is not the place for a eulogy of Pasteur, but no man has a nobler monument than the busy hive of industry that surrounds his quiet resting-place. Here are workshops where efforts are made to solve some of the problems of

disease, by men whose lives are given to the work, and whose hopes do not go beyond that of some success to crown their efforts. These workshops are perfect of their kind, and the tools they hold are handled by a force of men unsurpassed in training, ability and enthusiasm. Besides these investigators, endeavoring to open out new lines of knowledge that shall benefit humanity, others are constantly employed in making use of those already known, and in applying the results of past labors to present suffering. One may see there, any day and all day, men of world-wide reputation, each imbued with that spirit of which there is an all too small allowance in existence—the true spirit of scientific research, the desire for the enlightenment of the human race. There can be no other motive that compels this constant devotion to their life-work. The pecuniary reward is such that a statement of it is always met with wonder and incredulity. And yet these men are content with what their life offers them—work on day after day, and will continue until the time that work is no longer possible.

To one knowing these facts and how slight the reward may be, the sight of this busy place is a stimulation not easily forgotten or set aside.

I do not mean that here only is such self-sacrificing devotion to be found—far from it. The impressiveness of the place is due to the thought of how much good to humanity has come and may be expected to come from the workers that have been or are now there. Similar instances of individual devotion to duty in this direction may be found the world over; but, as I believe, no instance of so much accomplished and so much attempted in the same place.

The spirit of commercialism is absolutely absent; the fraternity of research for advancing human welfare is the good to which their efforts tend; money rewards that sometimes come—as the Nobel prize to one of them—are devoted

to the common aim, as by Pasteur himself, and no thought of personal aggrandizement comes to any who gain admittance to this brotherhood.

Such a condition of things leads a thoughtful mind to the consideration of how it could have come about—what underlying force could have produced such a band of devotees to a cult that has no attraction for the practical man, and, indeed, is beyond his comprehension. Still further thought comes, how can such a spirit be bred and cherished among us here; what is our duty and responsibility in the matter.

The impelling force in this instance is undoubtedly that of Pasteur himself—a man distinguished always for his simplicity of life, devotion to duty, and elevation of ideas.

As may be read in the story of his life, his career was precisely that of the fermentations he studied; marked by ceaseless activity, the constant production of fresh adjustment of ideas, much uncertainty and doubt, some useless by-products, and an end result of good, of lasting and widespread influence over all with whom it came in contact. Courteous in controversy, patient and persistent under failure, generous in praise to others, modest when success was reached—the influence of such a man could not help but be profound upon those it reached at all. It was profound, and to-day it governs the work carried on in his institute and by his pupils.

The racial influence is of course behind it all. The French spirit of scientific investigation in general, in its highest form, is of the same character—this is but an instance made conspicuous by a man of great ability.

This spirit then is the basis of the work here spoken of —simplicity, altruism, devotion to the truth; what can we do to develop and cherish it with us?

There is rising, not far from the place we now occupy, a group of buildings, that when completed will form a noble addition to the beauties of the city. They are the result of many forces—notably of the far-sightedness and enthusiasm of two men—this aided and supported by many others, whose generous contributions have made the result possible. The conception of such a plant was so daring that the first attempts to convince its hearers were discouraged and even now are not infrequently heard with scepticism.

The time for such a move had come however, and the men were at hand to carry it out. Now that their labors are approaching completion it is full time to consider what shall be done in those buildings when completed, and how the great trust shall be administered.

In his last address to the students of The Harvard Medical School, Oliver Wendell Holmes says this: "Leyden, Edinburgh, Paris, were each in turn the Mecca of medical students, just as to-day Vienna and Berlin are the centres where our young men crowd for instruction.

"These also must sooner or later yield their precedence and pass the torch they hold to other hands. Where shall it next flame at the head of the long procession? Shall it find its old place on the shores of the Gulf of Salerno, or shall it mingle its rays with the northern Aurora up among the fjords of Norway,—or shall it be borne across the Atlantic and reach the banks of the Charles, where Agassiz and Wyman have taught, where Hagan still teaches, glowing like his own Lampyris splendidula with enthusiasm, where the first of American botanists and the ablest of American surgeons are still counted in the roll of honor of our great University."—(O. W. Holmes, Some of my early teachers. Medical Essays, ed. 1888, p. 438; Houghton, Mifflin & Co).

So far as buildings and facilities are concerned the query and suggestion made twenty odd years ago may be an-

swered in the affirmative—the doubt that remains is the capacity of the successors of the great names mentioned to fully utilize and develop the trust placed in their hands.

The changes that have occurred in The Harvard Medical School within the last generation have been very great. In the early seventies the Faculty of the School took the step of grading the course of study and requiring students to pass from one subject to another in logical sequence and after examination; a step that was taken with many forebodings and that resulted in a tremendous pecuniary loss to the School (by cutting off the number of students), but that was so necessary that the struggle to carry it through cannot be realized to-day. In the early eighties the School moved into its present building, and it was then thought that many years would pass before its needs could even occupy the space then had. On the contrary—even with the help of the Sears addition—the most effective work for the students has been hampered for some time past, and some of the Departments are and have been crowded to the extent of often being obliged to refuse special students. In 1896 the Faculty decided to raise the standard of admission to the School by the requirement of a degree in Arts, Letters or Science—with some special exceptions—and this regulation went into effect in 1901. It had been looked forward to with much trepidation by many of the teaching force, and with lively fears that the School would lose so many scholars that it would be pecuniarily crippled (as has since occurred). It cannot be doubted however, that if this unfortunate result should temporarily continue, the friends of the School will support it through any such trying period, as generously as has always been the case. That this is practically certain, is shown by the encouragement to the efforts making to bring about the greatest advance that the School has ever thought of—a scheme for securing its future for generations to come, together with

the establishment of what will be, if it can be carried through, the most perfect University of Medical Science that the world has yet seen. A place where students of medicine in all its branches may come, to find an equipment perfectly adapted to their needs, and teachers prepared to foster and encourage research in all its directions for the demonstration of new truths, as well as to give instruction in all branches of present medical knowledge. (Adapted from Progress of Medicine, 1850–1900. H. C. Ernst, May 8, 1900).

How this may best be done in any case is matter for much careful thought, and the solution of the problem is to be sought in two different directions.

If a student is to take the best advantage of what is offered to him, he must have an opportunity for the proper care of his body, and the better the facilities for study that can be given the more likely is the best that is in him to be developed.

Now the right of community life, claimed by all companies of scholars, has been denied to students of medicine in recent generations and in this country. It is but recently that we have begun to look upon the medical school as anything but a trade enterprise — on the part of the teachers as a means for filling their pockets; on the part of the students as a place where they may be taught how to earn a living. The conception of a medical school as in any sense a part of a University, or a place where university study should be carried on and encouraged, is a product of those recent fermentations of which I have already spoken, and has but recently begun to develop in such form as makes it possible to realize it.

Directly connected with this thought, and growing from it, is the need for offering such opportunities for a scholar's

life as will make the hall-bedroom in a cheap lodging-house a thing of the past, and add to the dignity of student life in medicine what it now lacks — the charm of collective living with a common purpose. The first need therefore for the student life of the future University Medical Department is dormitories, in which the students, attracted by the courses offered or the reputation of the teachers to be heard, may learn to know each other and have easy opportunity for fostering the high ideals and learning early the noble purposes of their life's work.

Nothing can possibly take the place of this community of living in effective development of these ends, and the mantle of the Alma Mater should be spread over all her sons in embryo — even if not *in esse* (The refusal of the right to vote for Overseers except to graduates of the Academic and Scientific Departments.).

While these lines were being written it is evident that others felt the need of this provision for student life in other Departments of the University. For in the June number of The Harvard Graduates' Magazine may be found these words: We are come to the parting of the ways, where we must either make up our minds that the social life of the students is none of our affair — and in that case we had probably better give up the college as an institution altogether, and confine ourselves to the work of the schools which prepare men for practical life; or we must bring our men together into a real community, with a common life—a true college life.

This can never be done by outside dormitories built by private enterprise, because their effect is of necessity a segregation into distinct social groups based largely upon wealth. It can be done only by means of modern college dormitories, large enough to house the great bulk of the students within the College walls. Such a plan would benefit not any one class alone, but all the undergraduates.

. . . . . I shall be told that I am struggling against the spirit of the age, which is materialistic and plutocratic. But while it is true that every institution—and a University no less than any other—must recognize and adapt itself to the spirit of the times, it is also true that the very object of a University is to keep before men's minds those things that lie beyond the spirit of the age, the deeper things whose value is eternal. (A. Lawrence Lowell. The Harvard Graduates' Magazine. June, 1904, p. 527.)

Even if a student be comfortably housed, he must be fed as well, and as great an obligation rests upon the governing body in this as in the preceding direction. There is no more impressive feeling that a visitor experiences in Oxford or Cambridge than during a visit to the dining-halls of the colleges; each with its customs, its traditions, its portraits and its furniture, bearing a message of loving service to all who care to hear. Why then, should the students of any University Department be left to the mercies of the common eating house, with never a reminder that life has a more cheering face than faded walls and spattered linen at each renewal of its strength.

How much this question of feeding means, apart from its esthetic side, is indicated in these words of the Head of Harvard University — speaking recently at Springfield: There was another question presented to the Corporation, that affects another very useful thing in Harvard College, that affects the dining-hall — the dining-hall association. I suppose you realize the fact that it would have been impossible to build up the present University at Cambridge if the Corporation had not paid careful attention thirty years ago to the mode of feeding the students at Cambridge in a wholesome and cheap way. I believe that to be the absolute and literal fact. (Charles W. Eliot. Speech to Connecticut Valley Harvard Club, March 16, 1904. The Harvard Bulletin, March 30, 1904).

Here then is the practical side of this need emphasized and clearly stated as the result of thirty years' experience. The words mean the simple fact that good fuel must be provided to secure the best results from man's vital engines as for any other mechanism. But in addition to this there should be the influence exerted by comfortable surroundings made as beautiful and dignified as may be by architectural effect and mural decoration. (See also Report of Committee of the Board of Overseers of Harvard College to visit The Medical School, 1904, emphasizing the importance of this matter.)

A University Medical School is as compact a unit as a college of Oxford or Cambridge—its students may be welded into as close a body, very largely by such an influence as this. If thus brought together in study and in play, the influence of the strong will be more strongly felt and the weaknesses that might grow will at least be much less active in that growth.

Further, distinct provision for the mental nourishment of the medical student of today should be made. Time has been, when a scalpel or two, a bone and book or two, were all sufficient for his needs. This is no longer true, and the best of text-books — all of them; the best of Journals—all of them, should be in easy reach at convenient hours and in a comfortable home. The Harvard Union, the latest monument of a great citizen's generous love and interest in the young; an enduring influence for good in the community in which it stands, might well be the model, which with proper adaptation to the special needs, would serve the purpose well.

Provision for these needs is a duty that cannot be ignored, even if present conditions prevent its immediate fulfilment.

Further than this, too, there should be some care for the student when sick, and help of this sort is to be much more easily given if the student body be closely brought together, than if, as is too often the case, it be widely scattered and neglected. Recent experience has demonstrated the need of such care as is here meant — that there should be some man or body of men, whose aid might be sought in any difficulty concerning health, and by whom applications would be received with sympathy and attended to with promptness. After such an agency has been once established, its success would depend upon the degree of efficiency with which its duties might be fulfilled. It cannot be doubted that if well done it would prove an ever increasing source of aid and comfort to students standing in need of its services.

This then is the amount and kind of attention that should be paid to the care of the students of the Medical Department of a University. They should be made to feel that they are a part of a company of scholars—not individuals merely seeking for a means of livelihood. In the particular case used for an example, necessity has compelled the teaching force in medicine to be widely separated from the rest of the University. This, from many points of view, is most unfortunate, especially because it requires the establishment of complete institutions of the kind spoken of—dormitories, dining-hall, reading and assembly rooms — separate and distinct from those already in existence for the service of the larger body of students. The isolation of this part of the University body makes it all the more imperative that its installation should be complete.

A far more complex problem—even for paper consideration—than that just discussed in the development of University education in medicine, is as to what shall be taught and how?

Minute details it is not intended to enter upon here, but

there are general considerations that are of vital importance.

As wise and perfect a course as can be devised should be placed in operation leading to the best training for the practice of medicine. Inasmuch as present usage in this country requires that the practitioner of medicine should hold a Doctor's degree, it would be impossible to confer a lower with satisfaction to the main body of students—even though it be true that such Doctor's degree does not confer the right to practice. It may be hoped that eventually the value of the discarded Bachelor of Medicine may revive and that a more perfect scheme of University education in medical science may be worked out than is now possible.

It should be practicable to lay out a course qualifying the student for the practice of medicine, that would not require, as is now the case in many institutions, the preliminary education represented by the bachelor's degree in arts. As conditions are, this is impossible, and the best schools of to-day are graduate schools in the sense of requiring a preliminary degree—with some exceptions—in arts, letters, philosophy or science, of those who desire to enter upon the study of medicine.

The degree of Doctor of Medicine should however be looked upon, when conferred by this better class of institution—certainly when they are parts or Departments of Universities—as indicating that the holder has been trained upon broader lines than those qualifying simply for the practice of medicine.

One method by which this end has been sought, is by the offering of electives — at present only in the later years of the course — by a selection from which a student may prepare himself for a career in the more purely biological branches. This is not a perfect solution of the problem—for just as long as all practitioners of medicine in this country feel the need for holding the degree of Doctor of Medicine, just so long will it be impossible to give that degree the

same standing as a representative of general culture as is now held by the degrees of Doctor of Philosophy or Doctor of Science—which it should do from the University point of view.

The advance of knowledge in branches of biological science connected with a medical school, and the development of laboratories and research work connected with them, brings out a new point of view. It makes it possible to look at them as channels through which a way may be constructed leading to other University degrees — the paths leading to these degrees to run side by side with that to the Doctorate of Medicine on the one hand, and with those laid out by other Departments of the University on the other.

In a recent discussion upon the nature of degrees best given for scientific work, may be found the following by President Eliot: I beg to state that in my opinion, the best degrees to confer for scientific work, as for all other work, are the degree of bachelor of arts, the degree of master of arts and the degree of doctor of philosophy. In a temporary and provisional way the inferior degree of bachelor of science, master of science and doctor of science have been used—with some variations of name and corresponding letters—in our country, because the preparatory work at school required of candidates for these degrees has been smaller in amount and inferior in quality than the work required of candidates for the traditional degree of bachelor of arts. This relative inferiority of the scientific degrees now begins to be overcome. When it is overcome there will be no reason for persisting in the special degrees which have the word 'science' in their title. More and more the equal dignity and value of scientific subjects in comparison with the humanities is recognized. When that recognition is complete and universal, there will be no need of giving one degree for excellence in languages, history or philosophy, and a different degree for excellence in economics, architecture,

chemistry or zoölogy. All good work, in whatever field, ought to be rewarded by the same academic distinctions.

For these reasons I consider separate degrees for scientific work to be undesirable although provisionally necessary. They have heretofore been degrees of lower standing or repute, and they are likely to continue to be so regarded. I hope that they tend to be abolished. (Charles W. Eliot. Science, N. S., XIX. p. 812.)

So that the future complete Medical Department of a University must look forward to a variety of functions and must provide for a variety of degrees, suited to the various sorts of students that will, or should be, attracted by its teaching. It must be something more than a simple medical school—offering instruction only to those intending to practice medicine. It must do this of course, and in the best possible way —making arrangements for instruction in the laboratory branches sufficient for the needs of the well-educated practitioner, and supplementing this laboratory instruction with such a profusion of clinical work that the student pursuing the course will be well fitted—upon its completion—for the responsibilities that may soon be placed upon him.

Inasmuch as the best University schools now require the lower degree for admission, it has been argued that their function should cease here, so far as degree giving is concerned—since in one sense they are, as has been said, graduate schools already, and that they should confine their energies solely to courses leading to the degree of Doctor of Medicine and to research. It is however but a narrow conception of the importance of many of the fundamental branches of medical science, or of those closely allied to them, that would limit their functions in this way. It is not so very long ago that Anatomy, Physiology, and Pathology were all taught by the same person—as well return to this practice, as to claim that the Departments now controlling these subjects do not expand further than what is needed by the medical practitioner.

Since their sub-division, other subjects have assumed essential importance; Histology, Embryology, Physiological Chemistry, Bacteriology, Comparative Pathology are some of those that have thus grown to importance and to special names. Others are evidently rapidly coming forward, and students may be found in the laboratories devoted to any one of these subjects, who have no intention of becoming practitioners of medicine, and to whom the clinical work prescribed is unnecessary and possibly distasteful. At the same time their desire may be to study these subjects in direct connection with the human race—it is surely of importance that they should do so—and where could such instruction be as well obtained, or where could it be more easily provided, than if built up side by side with the instruction leading directly to medical practice.

The conception is therefore of something to be planted beside and grow up with the medical school as commonly understood. And since the complexities of the education of the medical practitioner are so great, the new sort of education should be administered by a separate executive body with a separate head—to which might be given the name of The Graduate School in Medicine: not of Medicine—for the plan here suggested involves laying out courses leading to other degrees than the Doctorate, open to non-graduates as well as to graduates in medicine. This new administrative board should of course be allied with other existing boards in The Faculty of Medicine, and thus the University Department of Medicine would assume the full functions and dignity that belong to it.

Included in such a University Department, then, if the idea were carried out to its full development, there should be courses leading to degrees other than and in addition to that of Doctor of Medicine, and of varying value.

Provision should undoubtedly be made in this country, as is so generally done elsewhere, for persons desiring to

enter upon public health work. There are many positions to be filled in the direction thus indicated—positions that do not require the usual training of a practitioner of medicine, but do need a portion of that training, that could well be furnished by a selection from the courses leading to the medical degree, with some additions or amplifications as the need might be demonstrated.

The University Department of Medicine must be a place of liberal education, as well as a training school for special lines of work. The fact should be recognized that a liberal training in biological science is as possible in connection with man as with the lower animals, and therefore courses should be provided in this Department that would be sufficient for the degrees of Master of Arts, and of Science, Doctor of Philosophy and of Science.

If the broad conception of the Medical Department of a University I am endeavoring to emphasize be made clear, it is difficult to believe that the objections raised to it will not disappear. The courses suggested for these degrees should be open to all who would be qualified to enter upon them in any other Departments of the University—not limited to those possessing a degree in medicine. The fact that they should be made up largely of laboratory courses, and must also probably be supplemented by and allied with courses in other Departments of the University, would prevent this limitation. They must also—at present—be limited to the laboratory courses, for the reason that clinical teaching is not now available for such purposes; that it may become so in the not distant future is a hope of its best friends. Some of the lines of development by which this hope may perhaps be realized will be indicated later.

The discussion of such a project as is here outlined, brings out a confusion of thought that it has been difficult to clear away—the distinction between "graduate instruction" from the University point of view, and "graduate

instruction" as usually understood in medical education and illustrated by the many post-graduate schools and polyclinics that have come into existence of recent years.

The first takes as a basis for the word "graduate" the the possession of the lowest—the bachelor's—degree in Arts, Letters or Science; it means the student who has taken the first step in the company of scholars. It undertakes to provide for him the means for reaching any higher grade that the special facilities of Medical Science may offer, and to enable him to reach any academic degree that his inclinations and abilities may lead him to desire.

The second takes the meaning of the word "graduate" to be limited to a graduate in medicine, and undertakes to provide for such graduate longer or shorter courses suited to his needs—in the clinics or in the laboratories as the case may be: by the very fact of such limitation the opportunities offered are limited in their usefulness.

From the University point of view the first is the most important meaning—from the Medical, the second. But unquestionably the University standpoint is the broader; it therefore should be granted its prior claim upon the use of the term "graduate course," and courses in the suggested "Graduate School in Medicine" should include both those leading to degrees other than that in Medicine, and those offered for the special benefit of medical practitioners. These latter should be made as full and as varied as the means at hand will permit; they should be extended and repeated so that the medical practitioner should be able at any time to satisfy his need for instruction in any direction. And side by side with them should be offered the more complete, the longer courses, that may from time to time be found worthy to lead to academic distinction other than that represented by a medical degree.

This medical degree—the doctorate—may itself be enhanced in dignity and value if the plain facts of the case

should become recognized and the custom of the country be overcome. The revival of the Bachelor's degree in medicine would secure this end. This Bachelor's degree is the only one that is really necessary to insure a training fitting the student for the ordinary practice of medicine—the licensing Boards and their examinations must act favorably to enable him actually to exercise the healing art. The Doctor's degree in Medicine should represent a higher training than this, but as has already been pointed out, the century's practice to the contrary seems to make it impossible to reach this end at present.

This condition of public opinion, and indeed of the medical profession itself, is the main reason for an effort to satisfy the other demand that makes itself felt—the demand for training in the biological sciences best developed in a medical school but that shall free the student pursuing such training from the, to him, unnecessary and burdensome exercises in clinical medicine.

A further argument in support of a separate executive board in charge of both kinds of graduate instruction spoken of, is that it would serve to enhance the dignity of what I have called the less important from the University point of view. All the better class of medical schools are busily engaged in developing this form of instruction, and in devising means for attracting this class of students—by offering advantages to the medical practitioner. This medical practitioner is a graduate, and there can be no doubt that it would prove a source of attraction to him that an institution offers him the opportunity to deal with a body concerned with his needs—separate and distinct from the undergraduate medical students. That this is so, has been shown by the success of such independent institutions as have developed themselves to this line of teaching, but whose work would undoubtedly have been strengthened if it had been affiliated with that of medical schools already

established. The influence for good and the stimulation exerted would have been reciprocal.

For the proper management of these degrees there would be needed a readjustment of University administration in many cases. This would be best accomplished by having all degrees conferred by a University Council—recommendations for such degrees to come from the Faculties under which the courses leading to them were given.

A most important factor in advancing medical teaching of all kinds, will be an expansion of the development of specializing in teaching that has already been referred to.

It is the universal experience that the best results are to be obtained if an instructor devotes his entire time to his teaching and does not engage in practice. This has come to be recognized as a necessity in many branches—those in particular that are concerned with laboratory work and laboratory research. The heads of such departments devote their entire time to the development of the Department —it would be impossible for its work to be carried on satisfactorily under any other arrangement. The entire staff of all such Departments should be under the same obligation, and sufficient living salaries should be offered to satisfy this end. Precisely the same principle should be extended to the clinical branches of instruction, and clinical teachers in the future should be required to give their entire time to the departments in which they may be engaged. They should use their hospital wards and clinics as the laboratory man uses his laboratory—as places of study, teaching and research, in which the constant presence of the directing head shall serve as an inspiration to the students attracted thither. Most occupants of University chairs do this very thing—there is a constantly growing feeling against the holder of a Professorship, and of lesser places as well, doing anything for pecuniary return that may curtail

his time for teaching and research. The same principle should apply to clinical teachers in a medical department of a University.

Two objections have been urged against this suggestion: one, that a non-practitioner is not well fitted to teach how to practice; the other, that competent men cannot be found to accept such positions at any salary that the existing Universities could afford to pay. The first objection is one due to long established custom and belief, and would disappear as soon as the experiment should be tried. So far as the practice of the healing art is concerned, its methods are now learned and taught in the hospitals—and have been so, ever since the old association of each student with some practitioner was abandoned. No student of the present day learns anything about how his instructor handles patients in private practice, except from what he sees in the wards, unless, as exceptionally occurs, he makes some private visits as a special favor. As a matter of fact — the treatment of patients — the practice of the art of healing — is more perfect to-day in any good hospital than in a home, and the instructor competent to fill the clinical positions here suggested would be a man also entirely competent to teach the necessary details of practice out of the wards — so far as they can be taught.

The second objection is one that is even less serious than the first. If such positions were created, the dignity of a University chair, with control of hospital wards and of the teaching in the medical subjects covered by the chair, together with leisure and opportunity for study — all this would attract a number of men from whom a selection could be made. There is now no difficulty in finding candidates for the laboratory positions — the difficulty lies not in getting a man, but in making a selection of the best from among those available. The genius is no more common to-day than at any other time, but competent persons for such positions

can be found, and that easily, at such salaries as are afforded for other University chairs. If this should prove not to be so, it would prove erroneous the belief that academic freedom, certainty and dignity offer any advantages as against a possible overflowing purse. Of course for such a purpose the University must have a hospital of its own — or at the least be so affiliated with a hospital managed in sympathy with its aims, that it shall have a control of the appointments to the staff.

There are many kinds of hospitals and various functions to be filled by them. As this Address is dealing with so many of the fermentations now inducing change in methods and means, it may not be out of place to remind its hearers what some of these functions are. The first and common duty of any hospital — the one that laymen and medical men understand everywhere, is to care for the sick poor. To help this function is at the bottom of the foundation of them all; the desire to help the sick poor is the reason for most of the donations and bequests given to them. This function has existed from the beginning, and that it was understood to be the primary duty of such an institution is indicated by the name itself—that the inmates were "hospes" —guests—and no fixed remuneration was exacted of those who received the benefits. This function will of course always remain a prominent one, but a second has been added that is almost as generally recognized to-day; this is the obligation resting upon a hospital to teach, and thus to spread more widely its beneficent influences, by giving to others than the attending staff the benefits of the study and experience to be gained within its walls. It is not many generations ago that no hospital was used for this purpose, and medicine was taught wholly by lectures. It was because the beginning in this use of hospital wards was made at Leyden that the great fame that city attained as a center of medical learning was so early reached. And

unquestionably it is largely because this function has come to be generally recognized that medical art and teaching have reached the position of dignity they now hold. There is however a broader application of this function of teaching that has not yet become widely known, and that must be applied specifically and broadly, as it is in occasional instances, in order that the best advantage of modern methods may be taken in developing and advancing our knowledge of disease. This consists in a union of the forces of the laboratory and of the hospital staff in a more definite and complete way than has yet been accomplished, and would require a unity of purpose and a sinking of individual position and privilege that might be difficult to secure.

There are problems in medicine—and the number increases—that cannot be solved by one man, or even by one department; they must be treated by a collection of the best men of the community having knowledge of the subject, brought together for purposes of consultation and sympathetic investigation. The hospital wards should furnish the material, the laboratories the means for study in this line, the clinicians using their knowledge for the binding together of the observations made. A way in which such collective investigations could be carried on is this—it may be put in practice by existing hospitals or by new ones. Let the board in control turn its attention to some single problem pressing for solution — the question of typhoid fever for example. Why is it, that after so many advances in knowledge, the apparent mortality from typhoid fever is no less to-day than it was eighty years ago? (R. H. Fitz. Typhoid fever at the Mass. Gen. Hosp. during the past seventy-eight years. Mortality, Intestinal hemorrhage. Perforation. Relapse. Trans. N. Y. State Med. Assoc., 1899—B. M. and S. J., 1899.) Certain wards might be set aside for the collection of cases of typhoid fever—or in the case of a small hospital, its entire capacity might be devoted to the care of cases of

this disease. Let it be understood that for a term of years nothing else would be received. Coöperation with other hospitals would secure sufficient material. The control of the wards should be placed — not with a permanent staff — but with a set of specialists selected for their fitness to handle various parts of the problem. All needed laboratory facilities should be added, and then for a period of three, five or more years, the whole of this complete force should be engaged in the study of the problem set before it. The advantage of such a method of collective study cannot be over-estimated. From the point of view of the hospital— especially if small — the reputation and efficiency to be gained by such concentration of effort could not be reached in any other way; the patients would benefit by the attendance of men and the use of methods specialized and perfected to the highest degree; humanity in general would be likely to benefit by improvement in methods, the result of such combined effort and study concentrated upon one problem.

The partial results to be thus obtained are seen in certain diseases in the results of treatment in the South Department of the Boston City Hospital, where known methods are applied by skilled experts to a limited series of diseases. The plan here suggested, however, involves the effort to penetrate unknown paths, and this upon a large scale with a clearly marked map of campaign.

Other problems could be taken up, as their importance become apparent, and the attending staff could be changed to suit the requirements. If I have succeeded in making this suggestion at all clear, I hope it may appeal to my hearers—as it does to me—as giving promise of most fruitful results when carried out.

The final fermentative suggestion I have to make is this. A most important development for freedom of learning will be, an extension of agreement among University

Departments in Medicine by which the migration of students may be fostered and encouraged. It will be impossible for any one institution to gather within its walls all the leaders in all branches of medical knowledge. But the best interests of the student — and of medicine — require that the learner should have the opportunity to profit by as much of the best as can be provided for him. This may be accomplished by creating such parallelism in medical teaching in a number of leading institutions that similar years of the course shall be practically equivalent; so that, if a student has completed a year's study in one institution, he shall be competent to continue his work in any one of a number of others. He should be allowed to do this without examination and upon simple certificate. If this could be carried out, it might happen that such a student would attend several different institutions in his course for a medical degree. He would be certain to go to more than one, unless the excellence of instruction in all Departments of each should be more nearly equal than it is easy to suppose possible. The stimulation to teachers would be not the least of the benefits that would arise from the adoption of this plan.

I have thus endeavored to present some of the fermentative changes through which the future growth of medicine is to be influenced.

I know that the accomplishment of some of the suggestions made is likely to be long delayed. Some of them, on the other hand, are nearing completion, and the prospects for progress, for liberal training, and for thoroughness are nowhere brighter than in medicine to-day.

[Besides references in the text, see The Doctorate of Philosophy in Medical Science.—Science, Aug. 28, 1903, and Journal of the American Medical Association, Sept. 26, 1903, p. 789.]

ARTICLE XXXVIII.

THE PHYSICAL RELATIONSHIP OF FINSEN LIGHT, RÖNTGEN RAYS AND RADIO-ACTIVITY.

By WALLACE C. SABINE, A.M.
OF CAMBRIDGE.

READ JUNE 8, 1904.

THE PHYSICAL RELATIONSHIP OF FINSEN LIGHT, RÖNTGEN RAYS AND RADIO-ACTIVITY.

THERE has recently come into medical or surgical use three physical agents or processes—Finsen light, Röntgen rays, and the radiations of radio-active substances. All three are capable of producing sciagraphs, though of varying excellence. All three produce somewhat similar changes in normal and diseased body tissues. They are thus related in their effects, and the present purpose is to trace any physical relationship that may be the basis of this similarity. All reference to the conditions under which they are produced and the method of handling them will be omitted, and only their essential natures considered,—Maxwell's electro-magnetic theory of light, of course in its simplest form, J. J. Thompson's highly probable hypothesis in regard to the nature of Röntgen rays, and the commonly accepted but rather complex conception of radio-activity. Finally, in looking for that which all three have in common we shall find it in their so-called ionizing effect —the breaking of molecules into subatomic particles, charging the larger with positive and the smaller with negative electricity. This effect common to the three is perhaps the intermediate process preliminary to the final physiological result.

The light medically rechristened as Finsen Light has long been known to physicists as ultraviolet light, and known

to have many remarkable physical effects. It differs from visible light only in the frequency of its vibrations. Visible light in turn differs only in frequency from the electromagnetic waves predicted by Maxwell, first discovered electrically produced by Hertz, and later made of practical use in a sensational manner by Marconi. To understand the nature of Finsen light, therefore, one has only to understand the nature of the waves of wireless telegraphy. While the difference in frequency and in the length of waves is enormous, in essential nature the two are identical.

The conditions of wireless telegraphy are so familiar to everyone that it furnishes an excellent starting point for the explanation of the nature of the electromagnetic waves and of the ether. When the electricity surges up and down the vertical wire at the sending station, and this occurs whenever a spark passes, waves radiate from it in all directions horizontally. These waves have a dual nature. They consist of electrical stresses vertically—that is to say, parallel to the wire,—and magnetic stresses horizontally. This point is, perhaps, worth elaborating slightly. The ether has three known attributes. These are ordinarily spoken of as its power to transmit electric, magnetic and gravitational forces. The mental picture which the physicist has before him is a little more definite than this. He usually pictures to himself the ether as having some sort of mechanical structure, and a number of crude models have been devised by different men. These, however, are most unsatisfactory, and the only safe statement is that the ether is capable of transmitting an electric and a magnetic stress. But his working conception is that an electric charge actually alters the condition of the ether; that this spreads to greater and greater distances; and that this condition of the ether is of such a nature that any other electric charge, which in the unaltered ether would experience no force, will, in the altered ether, experience a force urging it in a

particular direction. Further, the ether is of such a nature that a magnet alters it, first near at hand, but in a very short time at very great distances. This change in the ether when completed differs from the former change, for now a magnet is necessary to detect it. And, moreover, a most important fact is that a *moving* magnet or a moving electric charge produces both changes in the ether at the same time. Considerable is known in regard to these stresses in the ether,—for example, their velocity of propagation, but not enough is known to make it possible to construct a detailed mental picture. The ether also transmits gravitational stress, but nothing is known in regard to this, not even the velocity with which it is transmitted.

Returning to the waves of wireless telegraphy the application will be evident. When the electricity with which the wire is charged surges up and down, it changes the ether in its immediate neighborhood, producing some modification, we know not what; we only know that it spreads like an exceedingly rapid contagion—one hundred and eighty-six thousand miles a second, and that, on finding at any point an electric charge or a magnet, exerts on it a force. As the electricity surges first up and then down the wire, the modification of the ether is reversed, and waves are formed. Ordinarily in wireless telegraphy these waves, notwithstanding their enormous velocity, are about a mile in length. Were the sending wire short, the waves would be proportionately short. This process of shortening the conductor over which the electric oscillations take place has been carried so far that waves have been obtained only about one-eighth of an inch in length, and, could this process of getting shorter and shorter waves by using smaller and smaller oscillators be carried far enough, they would be identical with visible light,—a little farther, and only a little farther, and the result would be Finsen light. Throughout all this the point to be remembered is that these

waves are merely such changes in the ether that they exert a force on a magnet if they meet a magnet, or on an electric charge if they meet an electric charge. With the magnetic effects we are not here concerned, for the tissues of the human body are almost wholly non-magnetic, not quite, but almost wholly so. With the electric forces exerted by these waves we are concerned, for every molecule of the human body carries positive and negative charges. The application of all this, however, will be made later.

Röntgen rays are in many respects similar to light rays. Here, however, the source is not an oscillating electric charge which gives out a train of waves, but a negatively charged particle abruptly stopped by striking against the platinum disc in the centre of the exhausted bulb. The result of this sudden stoppage, J. J. Thomson has shown, is a very thin wave, or, as he calls it, a pulse, sent off through the ether. These pulses are, like light waves, electromagnetic, but instead of being in a train are single, are numerous as the number of bombarding particles is great, but only one pulse arises from each bombarding particle. The light waves and the pulses differ in another important respect. The Röntgen pulse is exceedingly thin. Thus, the length of a light wave is such that if two points were placed at a distance apart equal to the length of the wave, the most powerful microscope would just be able to resolve them. A Röntgen pulse is only about one ten-thousandth as thick. This exceeding thinness is the source of its great penetrating power. Such is J. J. Thomson's hypothesis in regard to the nature of Röntgen rays. The proof of this hypothesis might be found in a measurement of the velocity of the rays. Should the velocity be equal to that of light, the hypothesis would stand confirmed. Only two measurements have been made, by Brunhes and by Blondlot. The velocity was found to be the same as that of light; but unfortunately the method employed was faulty

in the extreme. Moreover, further doubt has been thrown on this work by the subsequent claim by Blondot of the discovery of N rays—an observation which no physicist of of high standing has been able to repeat, although many have tried. There is, therefore, no direct evidence of this kind supporting the hypothesis advanced by J. J. Thomson. Nevertheless, it stands as the most probable explanation of Röntgen rays, and is generally accepted.

The explanation of the radiations from radio-active substances has probably been made familiar by many recent discussions, particularly by Rutherford, who has contributed so much both theoretically and experimentally. These radiations apparently consist of the emission of positively charged particles, negatively charged particles, and ether pulse. The phenomenon is just as if an atom of radium in its minute structure consisted of two sizes of particles: the large, about the size of a hydrogen atom, charged with positive electricity, the others very much smaller charged with negative electricity, and, through some power, in regard to which there is absolutely no adequate hypothesis, this atom would throw off with tremendous velocity these particles. The positively charged particles form the so-called alpha rays, the negatively charged particles the beta rays. As a necessary consequence of any such process we should expect, as pulses in the ether, the so-called gamma rays. For just as the sudden stoppage of a rapidly moving electric charge causes an electromagnetic pulse in the ether, so the sudden starting of an electric charge must produce a pulse in the ether. Thus the Röntgen rays and the gamma rays are exactly the same in nature, and differ—if they differ at all —only in thickness. Whether the one or the other is thicker depends on whether it takes a longer time to stop the particles bombarding the platinum vane, or to start the particles off from the disrupting atom. So on this depends their relative penetrating power. The larger positively

charged particles constituting the alpha rays, because of their size and comparatively low velocity, have but slight penetrating power, and in consequence are of only remote medical interest. The negatively charged particles and the gamma pulses have much greater penetrating power and are pertinent to the present discussion.

Coming then to the physiological problem we have the effect of three physical processes to consider,—a train of ether waves, ether pulses, and a bombardment of negatively charged matter. Of these, the first two have a good deal in common. It is almost axiomatic to say that Finsen light and Röntgen rays, being purely phenomena of the ether, exert their first effect on atomic matter, and have their physiological effects as secondary results. While these waves and pulses are both electric and magnetic, we may, because of the non-magnetic nature of the tissues of the body, consider only the electric effects. Every atom of the body carries electric charges. It therefore is acted on by forces as these waves or pulses pass. A few years ago we would have said that the only effect of such forces would be to increase the motion of the atom as a whole, and it is pretty well established that this would have the effect of raising its temperature or of altering its chemical relationship. Very probably the greater part of the energy of all these processes is absorbed in this way, but it does not represent the whole effect. Within the last few years, new conceptions of the atoms have been developed. It is no longer regarded as an indivisible mass of matter bearing an indivisible charge. And not merely the atom of radium and other radio-active substances must be regarded as complex, but the collateral investigations of the last few years have shown that the atoms of other substances also are not the simple bodies formerly supposed. The phenomena of spectroscopy long foreshadowed this, but only recently have atoms been dismembered, and the separate parts studied.

This work is only now at its height, and the rather large mass of observations and data has not been correlated, and is in a somewhat chaotic state. Until all the conditions are known entire consistency is not to be expected. Still, the general conception of an atom that results from these investigations is, either that the atom is a central body to which is bound one or more minute electrically charged particles called corpuscles, or that it is a cluster of such corpuscles. The mass and the electric charge of these corpuscles have been determined for a large number of gases, and have been found to be the same for all, no matter what may be the total atomic weight. The mass of a corpuscle in any gas is about one eight-hundredth part of the mass of a hydrogen atom, while the charge on the corpuscle is about equal to the charge carried by a hydrogen atom during electrolysis. When a negatively charged corpuscle is torn from the atom, and it is now known that there are a great many ways of doing this, the remainder is charged positively. The two parts thus separated are called ions, and the process of separating them is called ionization. There are a great many ways of producing ionization. Almost any violence, particularly if it be electrical, done to the atoms of a gas may tear off a corpuscle from those atoms that happen to be in a sensitive condition. Thus Röntgen rays in passing through air or any other gas ionize it. The same is true of the radiations of radio-active substances; and this ionization may be produced by either part of the radiations—the radient charged particles or the gamma pulses in the ether.

The phenomena of ionization of gases by the three physical agents under consideration present considerable variation; some of these, although by no means all, can be explained. If we compare, for example, Röntgen rays and Finsen light, we shall find that Röntgen rays ionize air by merely passing through it, and Finsen light does not; although there is some

evidence that the air is ionized by the light discovered by Schumann, this light being of shorter wave length than that employed by Finsen. Or, speaking more broadly, any gas can be ionized by Röntgen rays, while light can ionize only a few gases directly. The explanation of this discrepancy between two processes so closely allied as Röntgen rays and light is as follows: The total energy of the Röntgen rays from an ordinary bulb is very much less than that of ultraviolet light as it would ordinarily be used in an experiment. One might therefore very reasonably, at a first glance, expect less rather than greater effect. Against this is the following consideration. The number of Röntgen rays, that is to say the number of pulses coming from the bulb, is very much less than the number of waves in the ultraviolet light; so much less indeed that the energy in each pulse may easily exceed the energy in each wave. Moreover, the pulse of the Röntgen ray, being only one ten-thousandth as long as the wave, the electrical stress exerted for equal energies in the single pulse or wave rises to an enormously greater maximum. It is on the maximum force that the separation of the ion from the atoms depends. Thus in their great maximum force the Röntgen rays have the advantage. On the other hand, light has an unquestioned advantage in its periodicity which results in a selectivity through resonance. This line of argument, if carried out, would rapidly pass beyond the limits of the present paper. The above is cited merely as an example of what must be looked for if one goes below the surface of the phenomena and beyond its empirical application.

In résumé, these three physical processes are electrical—not merely the Röntgen rays and the radiations of radioactive substances, but also the ultraviolet light. Their first effect is that of electrical violence upon the atom, which results in an increased atomic energy, and in the case of some of the atoms of partial dismemberment, and a resulting

ionization. The great physiological efficiency of the Röntgen rays suggests that ionization is the more important process.

Finally, it should be pointed out that the greater part of the study of these processes have been carried out on gases, while the physician is concerned with their effects on liquid and solid substances. Some work has been done in this field, and ionization results obtained. If there is to be, corresponding to the rapidly growing physiological chemistry, a physiological physics, there lies here in the ionization of liquids a field which the pure physicist, as such, is not likely to attack for some time to come.

ARTICLE XXXIX.

MIND CURES FROM THE STANDPOINT OF THE GENERAL PRACTITIONER.

By ROBERT T. EDES, M.D.

OF READING.

READ JUNE 8, 1904.

MIND CURES FROM THE STANDPOINT OF THE GENERAL PRACTITIONER.

If one wished to ascertain the general trend of opinion in the community relative to the progress of medicine in recent years, and with this object in view were to glance over the table of contents of a large number of medical journals from cover to cover, he might infer that leaving out surgery and obstetrics there was a sort of polarization going on in which one set of opinions grouped themselves around mental, psychical, and even miracle cures, as represented by all sorts of 'pathies, 'ologies and sects, religious and otherwise, and at the other extreme around a condition of polypharmacy such as the world has never before seen; where if we believe half of what we read on one side the wonder is that any one dies, if at all, before he reaches one hundred; or, if we believe another set of writers, that any one ever lives to grow up.

It may seem absurd, or at least disrespectful, to suppose that The Massachusetts Medical Society goes to either of these extremes. As a matter of fact I don't think it does,—not as a society—but a little experience showed me that one of these poles is not without its attractions for some of the members, and it is not an unfair inference that the other is drawing to itself some adherents by the fact that such a subject as that upon which I have been asked to say a few words finds a place upon the programme.

I had occasion to send to a good many of the Fellows some years ago a circular letter of inquiry as to the drugs which it was thought desirable to reject as useless from the U. S.

Phamacopœia, and what should be added. I received some answers somewhat as follows: "What is the use of putting in a lot of trash such as is now there? Give us something practical and useful."

Then would follow a list in which the influence chiefly to be noticed was evidently the latest advertising pages in the Journals. When one looks over pharmacopœias and works on therapeutics (and by the way I know of little more instructive reading on the subject than Stillé's Materia Medica compiled when the learned author was a young man, studied side by side with the last edition of the American Dispensatory of which the therapeutic part was written by the same author after many years of evidently well digested experience) and if he notes the changing lists of drugs which have, many of them, been vaunted just as highly and on apparently the same basis as those now produced in such bewildering rapidity by the coal tar chemists, and when he recalls the varied and often contradictory theories which have controlled the practice of medicine, many of them being, according to our present knowledge of pathology, absolutely groundless; he is obliged to acknowledge the vigor of the vis medicatrix naturæ.

But when we find that in spite of mistakes and contradictions, which the critics and satirists are not slow to perceive nor reluctant to remind us of, that the physician is still sought for in sickness as a helper and not merely as a sort of sanitary adviser, in order to promote recovery or at least to witness it, we have evidently to reckon with some kind of constant and permanent usefulness which has comparatively little to do with therapeutics as laid down in books, but which has been a part of the physician's armentarium ever since there were physicians.

This moral support or encouragement, the relief from responsibility, the substitution of decision for doubt, even a masterly inactivity when there are no active steps to be

taken, has long been recognized by the laity and by those literateurs who are fond of doctors but not of drugs, although it is apt to be somewhat slightingly spoken of by those who want something to be done promptly.

We are all familiar with the story, which I presume continues to go down from one generation to the next, and which in one form or another is told to us by gentlemen of other professions who wish to pat us physicians on the back on public occasions, of the doctor's smile which was supposed to be worth so many hundreds or thousands per annum, according to the social stratum to which he administered. The market for this commodity, however, varies greatly. While a lady fatigued with what she is pleased to term her social duties may be very willing to pay quite a liberal fee for his smile to the fashionable practitioner who "does not believe in drugging," which is the proper name to apply to the administration of all medicines except those which *you* happen to fancy, and which does *not* exclude in the case supposed "just a little sleeping powder" or "just an occasional nerve tonic," there are others who begrudge even a small one for the moral support of an equally competent physician unless they get something with it which they can taste or feel. But this sort of comfort is hardly therapeutics in the strict sense, and it certainly does not work wonderful cures. If there are any, they are discounted in advance and supposed to be in the ordinary way of business, unless perhaps they find commendation in the doctor's obituary.

Considering the very prominent position which psychic treatment in one form or another occupies in the public mind and the extravagant claims made for it, and hence its necessary importance in the professional consciousness, it is worth while to consider what morbid processes can be beneficially affected by mental action. Of course we do not expect or admit any influence of outside or foreign mind or spirit or nerve function upon the bodily processes of any patient

except through that patient's own mind or emotions. If any such be possible it is the nature of a miracle and does not come within the scope of human physiology.

"Christian Science" is so far correct that it refers its therapeutic action to the mind of the patient, stimulated of course by its meaningless phraseology and fantastic doctrines, which to a certain kind of intelligence appeal so much more strongly than either scientific reasoning or old-fashioned Christianity.

In an extremely philosophical and suggestive work (Anglo-Saxons and Others. By Aline Gorren), which I saw for the first time after this paper was written and in part read, I find so excellent a statement of the mental attitude of a large part of our community that I cannot forbear quoting it:

"The habit of action, and attention to the realities, have drawn away the mind from the field where the highest criticism of life is achieved, and the mental processes which such criticism calls into play are stiff from disuse. Human reason was told to act, to test all things for itself, to take no one's word for it, at the Reformation. But as a stimulant to its activity in the realms of abstract thought the Reformation was a failure. M. Guizot but observed what many others have seen when he wrote that in all Reformed countries something was lacking to the perfect organization of intellectual society, and to the free circulation of general ideas.

"And here, by the way, is to be found the cause of all that vague inconsequent metaphysical yearning which, with apparent contradiction, runs, like a vein in a rock, up through the solid unspeculativeness of the Saxon nature. Nowhere are there so many persons of sound intelligence in all practical affairs so easily led to follow after crazy seers and seeresses, and after new "psychic" doctrines of every known and unknown degree of wildness, as in England and the United States. The tenets of the Russian religious sects are at least free from the pseudo-scientific pretentions which constitute the chief absurdity of American and English metaphysical churches, healing-societies, and the like.

"The truth is that the mind of man refuses to be shut out absolutely from the world of the higher abstractions, and that, if it may not make its way thither under proper guidance, it will set off even at the tail of the first ragged street procession that passes. If no habit has formed of making discriminations, of separating the genuine from the false, there will be sad mistakes made, evidently. And we shall continue to see business men not to be 'taken in' by the sharpest in the management of their daily interests, not to be deceived in the quality of any material goods offered to them, sitting, ingenuous and receptive, under the jargon of some foolish woman with claim to a newly revealed cure for all the ills of the body and the soul.

"And the upshot? — In the aggregate, with all his lack of critical faculty, no harm comes to this order of man. His brain, as to the abstractions, is never clear, is always in a fog; but he works, and he fights if need be, and he goes on without ceasing in the thing which he has undertaken and he succeeds. He succeeds because he never questions that he is right all through, and takes much of his proof on faith.

"Who cannot feel the power that goes out from such a mental stand as that? A rationalistic modern Frenchman, debating his motives, cynical as to his virtues, philosophizing his own errors, doubts and is lost.

"This newer type of man does not debate, is by no means doubtful of his own virtue, and never philosophizes, not finding it easy work. And he is invulnerable, and every thing goes down before him.

"That trait of his which is called hypocrisy, but which is not hypocrisy, only a confusion of ideas and feelings, is the direct cause of one half of his impressiveness. The day on which he loses it will be a day of disaster."

What are the real physiological or pathological processes over which mental action, intellectual or emotional, can be supposed to have any effect?

There are certain ones covering a very wide field in the ordinary practice of medicine in which there is no satisfactory evidence of any such direct influence at all.

Fever, which is so important an element in pathology, especially of acute diseases, and a very large number of

chronic infectious ones is apparently uninfluenced. In the novel, to be sure, the mother, or the very old and wise physician, or the good "sister," or the pretty nurse, lays her hand upon the heated brow of the hero and his fever subsides. The so-called "fever of excitement," or "anger," over-excitement of any kind, may undoubtedly be controlled by reason, but there is not the least ground for supposing that the pyrexia of the pathologist, marked by a rise of temperature, an increased secretion of solids, and usually dependent upon a more rapid metamorphosis of tissue, is influenced in any important way by mental action, except so far as rest promotes and excitement hinders the normal processes of defervescence.

And yet in its early stages fever is to a large extent an affair of nerves. It can be reduced by baths and by various drugs. Why not by the determination of the patient or the spell of the faith curist? Simply because it is not. Over many processes of nutrition there is little influence for the worse and none at all for the better. Diabetes apparently sometimes takes its origin in shock, but the mischief once done is not to be undone by finding that the cause of the shock was an imaginary one.

Secondary anæmia sometimes seems very amenable to psychic influences, but probably rather in an indirect than a direct way.

Idiopathic anæmia, on the other hand, furnishes about as conclusive an illustration of the uselessness of an apparently well-founded encouragement as could well be.

What could apparently be more calculated to promote a cure, if a rational conviction of its possibility and actual presence could do such a thing, than the improvement in strength, in color, in well being, all sustained by the careful examinations of the physician who finds by his blood count increasing amounts of red blood and disappearing abnormal forms; all but the one of which the patient need

know neither the presence nor the significance. And yet how fallacious! If well-grounded and reasonable expectations seemingly almost realized, cannot cure, why should unreasoning and ignorant hope do so?

It was a remark of the older clinicians, that the mental condition of patients with disease above the diaphragm is much more cheerful than that with disease in the abdominal viscera. If this disposition had a saving virtue, then pulmonary tuberculosis and valvular disease of the heart ought to be much more susceptible of cure than acidity of the stomach or constipation.

The value, importance and efficacy, as an adjuvant, of psychic influence in such cases is not to be denied, and no one would be inclined to minify it either in theory or practice, but it is most certainly not a direct one. It acts by encouraging the patient to persevere in such more positive measures as may be necessary in the particular case. It has been wisely remarked that it is possible for a patient to be too much encouraged, so that he is not willing and anxious, as he ought to be, to take the measures which are of the utmost importance for his recovery. The precise proportion in which hope and fear may be most advantageously combined is a matter for consideration in each case for itself.

No alienist would consider the "delire des grandeurs" of the paretic, in which he is convinced not only of his own abounding strength and universal powers, but of his perfect health, as a favorable element in the prognosis.

It is not probable that the most persuasive teaching of any sect can for the average man and for the moment produce a greater sense of well being or lift him, in his own estimation, to a higher plane of thought than the administration of certain narcotics. The song may say,

"Fill the bumper fair;
Every drop we sprinkle
O'er the brow of care
Smooths away a wrinkle,"

but the pathologist will be likely to suspect that the "smoothing" process may not be altogether unconnected with edema, and finds that the more frequently this psychic influence is invoked the less of a prophylactic does it become to cirrhosis of the liver and arterial and other degenerations.

I think we are justified in saying, that over infections, degenerations, slow organic processes not dependent in any way upon mental activity, such as are those very largely which control the duration of life, the general health and the vigor of the constitution, direct psychic influences are practically nil.

Psychic influences come in contact with organic processes to affect them through the nervous system, and in particular through the vaso-motor and secretory nerves, and symptomatically not only these, but also the ordinary motor and sensitive.

The secretions are, as is a matter of common observation, largely under the influence of mental impressions and of sensation. The activity of digestion is promoted by the pleasing taste of the food, and even its anticipation, and by the congenial company at the meal, and the reverse of this is also true. Solomon said: "Better is a dinner of herbs where love is, than a stalled ox and hatred therewith."

It has undoubtedly happened to many of you to be consulted by some patient who informs you that everything he eats hurts him, except when he goes out to a big dinner. It is even possible that a few hours from now may witness on a large scale, speaking with all due respect to the committee having the banquet in charge, a similar triumph of mind over matter.

Constant attention to the processes of digestion is well known to have a disastrous effect upon its comfortable accomplishment. The weighing of food and, worse yet, the constant use of the stomach tube by the patient, are practices much to be deprecated.

The effect of mental influence upon the movements of the bowels is notorious, and it is utilized not only in the every day practice of the physician but in the mystic seances of the faith curist. The effect also upon the secretions of the kidneys and skin is well known, and although this is usually pathological there is no reason why it might not under some circumstances be really as well as apparently curative. One form of diabetes insipidus is distinctly hysterical and might very easily contribute to the triumphs of some healer if he had the good luck to succeed a physician who had made an erroneous diagnosis of dilatation of the lower urinary passages or even of interstitial nephritis, or if he were shrewd enough to suggest such a diagnosis himself, a diagnosis whose correctness might be made very conclusive to a nervous patient.

The intimate relations betweeen the genital functions and mental and moral conditions need only to be mentioned.

Mental influences upon many cardiac phenomena of a functional character, including attacks of palpitation, are well known.

One of the speakers yesterday spoke of his experience in examining applicants for admission to the police force where a systolic murmur present in a great many cases disappeared when the successful issue was announced. Another reported that the sight of the dinner has had more effect on the blood tension as measured by instruments of precision than did strychnia.

Albumen has been found in a great many cases of students awaiting examination.

Suppose for the sake of illustration (although the hypothesis is so wildly improbable that it is difficult to entertain it), that our colleague had been a careless or an unscrupulous diagnostician and the systolic murmur had been announced to the friends of the patients as "heart disease" and then they had been told that instead of being admitted among the elect of this city they were going to be admitted to the

Kingdom of Heaven on earth. He would have gained as great a reputation among the laity for his cures of "heart disease" as he has since among his professional brethren for his skilful and courageous use of antitoxin.

We have left, as a field for psychic therapeutics, those diseases or more correctly those sets of symptoms, which are closely connected with mental and emotional activity through the consciously or subconsciously active, sensitive and motor nervous system, *i.e.* diseases which we usually call functional, which do not always involve directly the nutrition or the processes of organic life but which may easily and frequently do so indirectly, and which interfere greatly with comfort, usefulness and the normal relations of the individual to his surroundings. But even here, where we should expect, and in fact do find, the greatest and most picturesque, almost the only triumphs of psychic therapeutics, there are many and great disappointing limitations. In many forms of insanity, which are apparently most especially appropriate for such treatment, we get nothing more than a relief, perhaps great, perhaps trivial, of some symptoms which are accidentally added to the fundamental processes of the disease. But this is an apparent and not a real exception, for there is little doubt that these are dependent upon organic processes frequently of a degenerative character.

But in melancholia, or, in more modern nomenclature, the depressed phase of the manic-depressive type, it would certainly seem that if psychic therapeutics had any field of action it could call its own it would be this. Of course no one can say how many mild or incipient cases of depression which do not come within the ken of the physician may have been cut short by a diversion of some sort—a bit of travel, the encouragement of friends, a chance remark, the influence of a faith healer or a piece of good advice from a physician, or by attention to the bodily functions, especially the digestion; but it certainly comes within the observation of us all

how often the encouragement is utterly futile, how the patient while freely admitting the purely subjective origin of his troubles nevertheless confesses that he is absolutely unable to look at his surroundings in a reasonable and logical way, or rather perhaps that this admittedly true way has no effect upon his depressive emotions, and we are unable by argument or exhortation to present matters to him in any such aspect as to produce the desired change of feeling. We are as inexorably obliged to await the slower processes of nature as if we were dealing with typhoid or tuberculosis.

It is seldom that the faith curist even claims to cut short such a case, but he does not for that confess a failure, for he can always represent that the patient does not give himself up to the healing influence. This is perfectly true, but it is because he cannot, and this very ability which faith or religion or magic ought to supply it is conspicuously unable to do.

If the patient could do this he would have no need of a cure and yet here, where it seems as if a change of emotional attitude would be so easy and so naturally obtainable by purely psychic means, is the very point where it has so slight an effect.

It is hardly necessary to reiterate the admission of the great value of psychic treatment, diversion, amusements, and best of all when possible an employment in which the patient can be interested, as adjuvants and for the relief of symptoms. The point is simply this, that the psychic end of the circuit cannot be controlled powerfully enough to set the emotional current flowing in the proper direction.

After such limitations as these we find left but little except cases in which symptoms, constituting in themselves a psychic disorder, counterfeit more or less closely something of a more serious and organic character.

The different varieties under which such disorders may show themselves would require and have indeed occupied

volumes for their description. Explanations are not satisfactory and amount to but little more than saying in one way or another that there are inhibitory influences of purely mental or psychical origin which can interrupt or confuse or disarrange the normal associations of movement and sensation, just as effectually for the time being as certain organic lesions, but they are naturally much more amenable to other psychic influences and hence to treatment of the same kind.

Accepting the usual nomenclature, and having made the exception of more clearly classified groups, we find that neurasthenia proper is not especially amenable in its essentials to psychic influences except temporarily and apparently. Their value as adjuvants however can hardly be overestimated.

If there is a real deficiency of nervous force, and not a mere counterfeit of it by indolence or timidity, it can hardly be expected that it will be at once restored by any simple brief stimulation of one part of the circuit. Time is required to bring back what has been overexpended, but other conditions being favorable, the psychic stimulation is necessary to enable the elements to profit by the nutriment brought to the cell, just as the muscles, after being kept at rest, for the sake of a fractured bone or the injury of their motor centre, need exercise to bring them back to their normal force. Hysteria, that ill defined and preplexing psychosis which has been the foundation of so much that is false and illusory in therapeutics, is undoubtedly the peculiar and favorite stamping ground of the faith curist and miracle monger; not under its own name but under those of the organic diseases which it counterfeits.

A graphic clinical picture, showing with great scientific accuracy what can and what cannot be expected and obtained from profound psychic impressions, is to be found in Zola's novel of "Lourdes," powerfully realistic though not

real, depicting the sufferings, the disappointments, the commercialism, the faith uplifted and the faith destroyed and the rare miracle cures of visitors to that famous grotto.

What are the methods of psychic treatment? Is there anything special or mysterious about them? Is it necessary for the self-respecting practitioner to put on the manners of the quack or to claim that he has in his control supernatural agencies, or that he should advise his patient to give himself to the study of empty verbiage and theories which have no meaning to the healthy mind?

I do not think these questions can be answered in every case alike. Two diagnoses are necessary—that of the disorder and that of the patient. It has been said recently by distinguished members of our profession, and by other eminent citizens, that the utmost honesty and frankness may be used in dealing with patients and that they may be told the exact truth. Both may have been correct from their point of view, but most practitioners have to deal largely with persons who are not soldiers or philosophers or saints, who are not tired of life and, above all, do not like to be told of their own weaknesses. I think the practitioner is justified in giving the patient the benefit of the doubt, when there is any, and in putting the best side of the case before him, without insisting on the other. The average man will not be comforted by being told the exact percentage of recoveries in the disease which bears the name of what he thinks he has. He needs a unanimous vote of confidence. One reason why a man with a perfectly sane and healthy mind wishes to consult a physician is that he may throw upon his shoulders the responsibility and free his own mind from all the ifs and buts which weigh heavily upon it and retard his recovery.

Even the lawyers admit that there are many cases where both sides have a certain amount of right, and that it is more important that the case should be *decided* on one side

or the other than that it should be left indefinitely *undecided*, because absolute justice cannot be done to both sides.

When the physician is sure that he is dealing with a case of neuromimesis he cannot be too strong in his encouragement and exhortation, and he may then assume more of authority than comes from a simple scientific knowledge, which would very possibly be scouted by the patient. He had better fall back on his prestige and reputation and such measure of oracular mien and expression as nature may have endowed him with, and give no reasons, and, above all, not give the true name to the disease. This is an average, and not a universal, rule. There are patients who can bear to be told the truth—and nervous ones at that—but it is well to study the patient's disposition as well as his disease before you are too frank in your expressions.

But when nature kindly draws a vail before the dangers of the future, I think we have no right, for the sake of absolute scientific accuracy, to draw it aside and destroy the hope which may be the last fighting chance.

There are various ways in which treatment addressed to the patient's mind may be given, ways as different as there are patients and physicians. One practitioner cheers his patient by judicious pleasantry, another by a carefully reasoned exposition of the grounds upon which his recovery is to be confidently looked for, another by religious influence; one by hypnotism, another by non-hypnotic suggestion; one quack by the confident repetition of an absolutely unsupported and probably absurd assertion, another by absolute silence.

The methods may be various, but the essential thing is the implanting not merely in the patient's reasoning and conscious mind, but in what we call, as it seems to me somewhat inconsistently, the "subliminal consciousness"; that is, the store room of past and forgotten associations, ideas, and emotions of which the patient is not at the time

definitely aware, but which may be in various methods reached, the idea of recovery and health, of the unreality of the pains, of the ability to walk or to talk.

Our late associate, Dr. Russell Sturgis, used to practice a method which he considered of great value in utilizing the slighter degrees of hypnosis for diagnosis and treatment. It seemed to me that it went but little beyond inducing a specially confidential and persuadable frame of mind and completeness of recollection, so that the causes of abnormal psychical conditions became more clearly revealed and consequently more thoroughly removable.

Breuer and Freud have used a method which does not necessarily depend upon hypnotism, but upon successive seances of enquiry and upturning of the subliminal consciousness to its lowest depths.

According to their theories, hysteria is always based upon some special psychical injury at an early age, its concealment and the suppression of the appropriate motor reaction; as, for instance, in the case of an official who did not dare to resent the insult offered him by his superior, but became nervous and hysterical until he had confessed the whole matter fully and got well.

The great remedial value of a full and free confession, often perhaps of some trivial affair, is well recognized in our profession, although less formally than by the Catholic church and some others.

It is not uncommon in hearing patients relate their wonder cures, or perhaps more frequently after the stories have passed through more than one narrator, to learn that they had no faith whatever, but submitted to the treatment in order to please importunate friends, and so on.

I venture to doubt the correctness of this. I have no doubt that often when the patients may be as willing as any of us to admit the foolishness of the methods pursued, they have yet a real but subconscious belief that something is to

happen. In some cases the belief in something weird, uncanny, seems to be an essential point.

As to the particular doctrine taught in the various sects there is little choice, except that it should not be too repugnant to the patient's deep-seated convictions, religious or social.

A strenuous repetition of a positive assertion seems an absurd sort of method to be advanced when unsupported by any argument, proof or illustration; but if any one doubts its efficacy among a proportion of mankind large enough to have a great commercial importance, I would ask him why medicine makers find it to their great pecuniary advantage to disfigure miles of railroad and square miles of territory with simple repetitions of the statement that "Blank's pills cure everything," or that "Children cry for Catcher's Gambogia."

Many of the various modern mechanical means of treatment, especially those which are used in chronic nervous diseases, owe a certain part of their efficacy to the constant impression of something being done, of taking up the patient's attention while nature and time are taking their slow course. A prescription of this kind may be considered as having, like many prescriptions of drugs, a proportion of mental influence as one of its ingredients.

Electricity, for instance, is difficult to disentangle from this element of error. I recollect on one occasion in a society of neurological specialists an apostle of a peculiar form of electricity was exhibiting a new electrode, and on being rather hard pushed by the other members, not only as to the advantages of that particular form, but of electricity in general, fell back from one line of defence to another until he reached the last resort of saying that it had a very good moral effect in hysteria, which is no more than might be said of any drug in or out of the pharmacopœia, from abelmoschus to zygadenus, if administered with due solemnity, or of no drug at all.

The various kinds of active exercise have the very distinct advantage that the patient is kept from thinking of himself not only by the unusual sensations, but by being obliged to use his will in a definite direction, which is exactly what he needs to do. This is especially to be seen if the exercise consist in some employment in which he takes a real interest, and this must, of course, vary greatly with each individual patient.

The beneficial effects of certain systematic exercises in scleroses of the cord is not to be accounted for entirely on this ground. As I presume will be more fully and scientifically set forth by my successor, it is a question of readjustment, and not of restoration. The damaged tissue cannot be replaced, but other comparatively sound cells, nerves and muscles may be able, under training, to take up a part of their work and carry on the function with greater or less approach to perfection.

In how large a proportion of the ordinary work of the practitioner, beyond the cheering and encouragement that he may always offer to some extent as a contribution to his patients' comfort and happiness, is psychical treatment of consequence? According to some sects, the whole of medicine, surgery and obstetrics, although it is understood that recently in the highest circles in the latter departments the true believer is graciously permitted to seek human in addition to divine assistance and receive relief through agencies which do not act merely through the mind. According to the skeptics, only the cases of nervous and silly women.

How are we to account for the hundreds of assertions of cures obtained by all sorts of means which range from the crudest mixtures of common, perhaps inert drugs, to the most transcendental imaginings of cultivated and intelligent persons?

If there were time there would be an opportunity for a digression on the meaning to be attached to the words "cul-

tivation," and "intelligence." But we may leave this aside and allow for a very liberal discount for the lie pure and simple, paid for by the advertiser to the patient perhaps, and heavily and appropriately to the journals which are willing to take such money with the same hand that does not refuse even the criminal advertisement. Then come other lies in various grades.

It would not be difficult to show by example that a person may be highly cultivated, intelligent, even with scientific talents of a high order and yet under the influence of feelings and desires entirely uncritical and credulous.

We should then find a very considerable percentage due to imaginative but entirely honest exaggeration, by the shutting of the eyes to one set of facts and the opening them very wide to another. If time permitted I should like to describe one instance which happened to display both sides to me, which shows how the mind seeking for a miracle manages to get itself gratified.

Darwin makes the very pertinent remark that he found that facts which were in disagreement with his theories slipped from his mind much more easily than those which harmonized. If such a cause of error required to be guarded against by a Darwin what can be expected of ordinary humanity, which is not only not on its guard against it but cherishes it with fond affection.

Then there is the small residuum of genuine cases in which some form of functional nervous disease, a paralysis, a contracture, a neuralgia, a convulsion, which has undergone all sorts of scientific treatment in vain yet yields in the hands of a faith curist.

Statistics in such matters are obviously very untrustworthy. A few years ago Mr. H. H. Goddard prepared for his graduation thesis at Clark University a paper upon this class of cures and was kind enough to show me some of the answers returned to him, some of them referring to patients who had

been under my care. He came in contact with one man who had had a good deal of success in dealing with many cases of which a considerable proportion were evidently functional nervous, and who was willing to give information which Mr. Goddard believed to be full and candid. He was not a medical man and his diagnoses were consequently not very trustworthy but were probably honest. He was willing to speak frankly of the cases which were not cured. This information Mr. Goddard compared with the published statistics of the celebrated medical hypnotists as representing the scientific side of the question. He found that in a general way the two sets of cases corresponded fairly well both as to percentages of cures and as to the class of cases benefitted.

"He (Dowie) says, in a certain issue of his paper: 'I pray and lay hands on 70,000 people in a year.' At that rate he would have prayed with 175,000 in 2½ years. But in the 2½ years immediately preceding this statement, he reports only 700 cures. The conclusion is indisputable that only a small portion of those prayed with are cured." —Goddard.

As regards the every day practice of medicine with its very great proportion, among the acute cases, of infections; and among the chronic infections and degenerations, scleroses and new growths, psychic therapeutics as a primary and essential treatment finds but little scope, while as an adjuvant to the healing forces of nature and time it is and always will be a most precious resource of the physician and he who wields it most judiciously will be the most successful.

Among the psychoses, notwithstanding there are many and great limitations even upon the side which we must still consider functional — though any day some new method may show us the incorrectness of this view—the relation is reversed and the physician must look upon the building up processes and the various appliances in use, pharmaceutical

and otherwise, not only for their real and direct but for their mental impression.

For either case he most look before all for a diagnosis.

ARTICLE XL.

A CONSIDERATION OF MENTAL THERAPEUTICS AS EMPLOYED BY SPECIAL STUDENTS OF THE SUBJECT.

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READ JUNE 8, 1904.

A CONSIDERATION OF MENTAL THERAPEUTICS AS EMPLOYED BY SPECIAL STUDENTS OF THE SUBJECT.

THERE are but few kinds of disorders which interfere more with the happiness of the community than those which cause a painful and hampered action of the mind though without implying the presence of serious mental derangement. The disorders to which I refer are mainly those characterized by insistent thoughts, emotions and impulses, "obessions" and "morbid fears," which the patient recognizes as largely causeless yet cannot shake away. Starting, perhaps, with some severe or prolonged emotional strain, and on the basis of some weakness or defective organization which one would call hysterical or neurasthenic, these morbid tendencies become deepened by habit, and expand into complex systems or "temperaments"; which mingle their influence with every motion of the mental life; or they show themselves in the form of occasional outbreaks which really have a definite, though hidden, history, or as constantly recurring and seemingly causeless tricks of muscular movement, the "tics" of the French writers, and in many kindred ways.

Even the "fatigues" and faintheartedness of neurasthenia are, in some measure, to be classified amongst these incoordinations of the mind.

These affections cloud the happiness of many persons whom every doctor meets upon his daily rounds, and yet, in spite of this fact, they are far more susceptible of relief, under prolonged and skilful treatment, than is commonly supposed.

On these accounts there is no branch of therapeutics more deserving of study than that which forms the subject of this conference. Of course, the mental therapeutics may rarely be the only kind of treatment to be thought of. Sometimes an impaired general nutrition stands in the way of improvement, or some local ailment, which perhaps a gynecologist or an orthopedic surgeon can remove, has lowered the vital tone just enough to make the patient a prey to troubles which would otherwise have been resisted, and if a such a physician or surgeon is wise he may make his treatment the starting point of a new departure of hopefulness to which, perhaps, no other avenue could have been found.

But after the ground has been cleared through a consideration of these possibilities, there remain innumerable cases where some sort of specialized mental influence or education has to be employed. Of course, in practice, each case has to be studied by itself, but it will be useful for the purposes of this paper to distinguish between the patients who are more or less continuously and painfully conscious of nervous weakness or hypochondriacal depression and those whose symptoms present themselves intermittently, or only under certain conditions. The patients of the former class are mainly those suffering from neurasthenia, with its attendant distress of body and mind, while the second class is represented by the sufferers from morbid fears of specific sorts, or occasional outbreaks, often of a serious nature, which may, for convenience sake, be classed as hysterical. In the case of the first of these two classes the question of bodily nutrition and reflex excitations is much more important than in that of the second class, and when these questions have been eliminated the problem as regards the mental state is the relatively familiar one of seeking to secure the conditions under which the patients can live a relatively active and useful life, of inducing in

them, in an adequate form, the sentiments of courage, confidence, patience and determination, and making them familiar with the dangers that are likely to threaten from without and from within.

It frequently happens that the question of happiness or unhappiness of patients with severe forms of neurasthenia depends largely on influences which would ordinarily be classed as social rather than medical, though, in fact, the physician can help greatly in determining what the outcome of these influences shall be.

I have heard so many patients say that they had formerly entertained great disdain for nervous weakness, if not for the patients who allowed themselves to be controlled by them, that I think such sentiments must be very common in the community, and must be the cause of many needless burdens of distress. The time must surely come when nervousness and even serious mental derangements will be regarded in much the same light as other forms of illness, and with the growth of such a sentiment as this there will be great mitigation of individual suffering. For, to a great extent, a man's estimation of his own misfortunes is a reflection of the estimate made, or which he thinks is made, by others. I am inclined to believe that the real root of the disdain to which I have referred is sometimes a sense of dread for themselves, on the part of those who entertain it, which they try to suppress by an instinctive affectation of superiority.

It is quite natural that where influences of a spiritual order are in question, laymen should feel themselves on a par with the physician, and the fact that they often do so has shown itself in a thousand ways.

Most of the therapeutic influences coming under this head have taken their coloring from philosophy or religion,* and

* A suggestive and stimulating essay entitled "The Spiritual Treatment of Neurasthenia," by Arthur A. Cary, is published in The New-Church Review, for April, 1904.

the patients in whose behalf these influences have successfully been exerted have often gained, through their illnesses, an insight into a higher life. Within the past decade another interesting and successful enterprise has been set on foot by a citizen of Zurich, Grohmann by name and originally an engineer by profession, consisting in a species of sanitarium where the healing influences are represented by real work, and simple habits of living, in a small community. The founder of this almost unique establishment is a man of intelligence, devotion, and force, and his work is carried on under the auspices of some of the best physicians of Switzerland and Germany. The superintendents of sanitariums might well learn a lesson from this hardy effort, which is characterized, perhaps, not so much by novelty of idea as by novelty in the thoroughness of its execution.

It was intimated above that neurasthenia sometimes shows itself under a form that might be called "hysterical," but to avoid a term which is susceptible of misinterpretation, one might say it sometimes happens that persons who have suffered from neurasthenia fall into habits of invalidism which cling to them after they have really recovered from their original illness, and which the memory of their former sufferings makes them dread to disregard. The "neurasthenia" of youthful adolescence is often of a similar order. These are cases which might, strictly speaking, be better considered with the disorders of the *second class*, of which we are about to speak, but in fact it need only be said of them that they offer an excellent chance for intelligent and vigorous handling, the aim of which is to restore the confidence which has been lost.

The *second class* of cases, represented by the morbid fears, fright psychoses, insistent ideas and epileptiform or hysterical outbreaks, are much harder to deal with, and yet it is with regard to these that some of the best work of the last ten or twenty years has been done.

Fortunately, it is also true that some of the insistent fears which seem so invincible when they are present, turn out to be possessed of little substance if resisted boldly and not taken too seriously. Under these circumstances a strong effort, or a series of graduated efforts, in which the patient is firmly supported by the physician, may overcome a morbid fear of long standing. The determined adoption of the attitude of dogged indifference, based on confident and authoritative advice, will often suffice to carry the patient through the first severe trials. Sometimes the triviality of a distressing but causeless fright can be made to appear more evident through the demonstration that it can be relieved by a trivial distraction, just as a slight turning aside of the attention may relieve the cramped mental attention of a balking horse.

On the other hand, there is an equal or greater number of insistent ideas, which seem trivial yet are so hard to master, that one is reminded of the legend of Thor, who in vain tried to drain off the horn of wine that had been given him, and found, at last, that it was connected with the sea.

It is a noteworthy fact that a good share of the advance in modern psychology, involving the so-called psychology of the sub-conscious life, is based on data which are the contribution of medical science. These studies have been of immense value in the interpretation of those forms of mental incoördination to which allusion has been made. They have taught that while we regard ourselves as free agents and our mental life as forming one harmonious mechanism, no one is really as free, no one's life is so complete a unity, as he would like to think.

Every one of a man's acts expresses, in a sense, a history of his life. What he has done before he will tend to do again, and the old habits and motives (themselves the expression of his total and partly unconscious experience) will ever strive to reassert themselves.

This principle will be admitted, but it is not usually realized how strongly and instinctively a man lends himself to self-deception in this matter, not what an important bearing this self-deception has in causation of disease. It is on this point that I now wish particularly to speak.

Under the exigencies of competing successfully with our fellow-men, a strong instinct has developed itself which leads us to push to the front, into the field of our habitual consciousness, only those memories and motives which seem of distinct utility in the attainment of our present, conscious needs. This arbitrary group of memories we call "ourselves" and we push out of sight those experiences of our past life which do not harmonize therewith.

It is of no apparent use to a man to recall a painful emotion or a serious fright. If he could he would gladly wipe them out from the records of his life, and, as it is, he strives to thrust them into the background, not realizing that he might, if he had the power, training and insight, consciously assimilate these experiences, and that his present motives would be fuller and richer for their presence.

But it often happens that these painful experiences and memories which, in his ignorance, he thinks so needful to be rid of, often refuse to be banished thus cavalierly. His refusal to deal with them does not make them disappear from his mind, but as he cannot or will not assimilate them and utilize them and acknowledge the lessons which they could have taught, they lead a sort of parasitic existence in the mind and form a species of organization hostile to his well-being. And thus it happens that a serious breach is made in the unity of the conscious life, and a breach that may constantly tend to widen.

To this process the term "dissociation of consciousness" is often given, and it is one of far-reaching significance. Thereafter, when a call for action comes, a double set of reflexes—as for convenience we may call them—will tend

to show themselves; one set expressive of the organized experiences, memories, and motives which the individual would be glad to have reckoned as constituting his personal identity, the other set expressive of the mental experiences which have clustered around some of these unassimilated painful emotions as a centre.

Thenceforward, also, the conscious mental life will be marked with confusion, with a sense of an unexplained something which is wrong, and with inefficiency and self-distrust. In many cases the disorganization has its roots even far back in the years of childhood.

The function of the doctor is to heal this breach, to neutralize the dissociation which has taken place, and to restore the previous unity of the mind.

It is with regard to these cases that the method first employed by Janet, and by Breuer and Freud is of such great importance, and although the first communications of these writers were made a good many years ago, it is to be observed that their painstaking labors and those of a few others who have worked upon the same lines, amongst whom are to be mentioned our own colleagues Russell Sturgis, Hamilton Osgood, Morton Prince, and Boris Sidis, have strongly reinforced the value of the facts as first stated.

It has been found that painful experiences are often enabled to work mischief just because they are hidden from the patient's view. The aim then ought to be to bring back the hidden experience into the clear light of consciousness, so that its real insignificance can be estimated, after which the reorganization of the disordered forces of the mind is likely to take place of itself. Sometimes the result thus aimed at can be attained by inducing the patient to talk at length and in full detail about all the circumstances connected with the onset of his illness. So strong, however, is this instinct for thrusting the unwelcome experiences out

of sight, that the patient may, at first, declare himself wholly unable to recall any facts of which the physician can make use for making clear to his own mind the exact history of what has taken place. Nevertheless, if the patient co-operates voluntarily by withdrawing his attention from all distracting thoughts, relaxing body and mind, allowing his memory to be led by skilful questioning, and forcing himself to narrate every detail, however trivial or painful, connected with the onset of his troubles, it may be found at last that the whole story will be disclosed which the patient had instinctively excluded from his memory, and that, in this way, the chain of morbid links, stretching from the patient's present condition back to the experiences in which his symptoms had their rise, can be laid bare.

In a certain sense, it may be said that the hands of the clock are thus turned back to the date of these events, and that the patient is made to live over again that period of his life. Under these circumstances one can deal with him as one would have been glad to deal with him at that time, but with the difference that he is now more in the mood of responding favorably to encouragement and to reassurance. It may thus be said that, in a new sense, it is possible to "minister to a mind diseased," to "pluck from the memory a hidden sorrow."

This method of analysis of the patient's memory is useful for the purpose of diagnosis as well as of treatment. Through it the discovery may be made that conditions which had been thought to indicate the existence of serious forms of epilepsy are really curable attacks of a hysteroid character. Sometimes this analysis and treatment can be carried out more effectively when the patient is placed fully in the hypnotic trance. When this is decided on, the object of the treatment is explained beforehand, and the patient is assured that when he wakens from his trance he will remember clearly all the facts connected with the painful experience which it has been sought to discover and to remove.

The thought of hypnotism brings unpleasant associations to the minds of many persons. It has been thought that it tends to loss of independence and weakening of the will, and that it is, altogether, a practice to be discountenanced. As a matter of fact, these dangers do not, practically, exist. Even at an earlier time, when hypnotism had its day as a popular craze, the evils that were attributed to its use were not due to the hynotism as such, but to the conditions of morbid excitement that went with it. Certainly, when it is employed by skilled persons, for the purposes that I have suggested, and with the sole desire of accomplishing through its means the object of the treatment, which is to make the patient master of himself, there is no objection to its employment, and it may be used as a means of strengthening, and not weakening, the will, with the same confidence that this result is sought as the outcome of a rational conversation.

It is an idle criticism to say that hypnotism should not be employed because it induces states which are "morbid" or analogous to hysteria. We are continually inducing "morbid" states for therapeutic purposes, as by ether and morphine, and artificially limiting and rearranging for special ends, the movements of our conscious life. In each case, the only question is as to the value and significance of the ultimate result, regarded in all its aspects.

The cases of "traumatic hysteria," which occur so often in every physician's practice, afford remarkably good illustrations of some of the points which have been mentioned in the foregoing remarks. Thus, we have in them examples of typically painful and insistent experiences, which are here of especial interest because they often occur among persons not previously of an hysterical temperament. The instinctive effort to push the memory of such experiences out of sight, and likewise the fact that they really continue to live and to act with gathering force, are clearly brought out

in the histories of these patients. Frequently such a person will say that he has followed his usual avocations, and that the thought of his mishap has not been prominently present to his mind, and even that he cannot recall distinctly the events that occurred. Nevertheless, a careful investigation will show that in his dreams at night, or in hysterical outbreaks, the circumstances of the accident are reproduced in minute detail. It also may appear that one arm or leg or one half of the body feels weak and is lacking in sensibility, and that effort of every kind is attended with fatigue and distress. Such a patient does not know that he has been suffering from a dissociation of his consciousness, and that while he has been instinctively striving, for his own peace of mind and for the sake of conventional appearances, to present the same front to the world that he presented before the accident, he is really under two masters, who do not act in harmony; that his mental forces are like an army through whose ranks a more or less organized demoralization has been spreading. He is not aware that the anæsthesia may, for the dissociated portion of his consciousness, be a hyperæsthesia, nor that the weakness and fatigue indicate that he is carrying a burden that is unseen.

Sometimes the patients of this class get well readily of themselves, under the influence of a return to their usual pursuits, but, in my experience, this result is less common than that of a more or less prolonged invalidism, unless, indeed, the case is taken in hand early and the patient is intelligent enough to put himself under favorable conditions for a cure. We have recently been able to relieve, at the Massachusetts General Hospital, one such patient who was suffering in an acute form from the anæsthesia and hysterical tremor consequent on an accident, and in spite of the fact that a suit-at-law was pending.

The foregoing brief and diagramatic sketch of certain aspects of mental therapeutics must be supplemented by at least a reference to certain other points.

It should be distinctly remembered that the necessity for mental treatment, even in the severer cases, does not exclude the necessity for general and local treatment, and this is true even for those conditions where, by strongly turning the mind in one or another direction, and enriching the conscious interests, we can enable the patient to overlook and forget his sufferings. We may, indeed, sometimes accomplish this result, for a time, by exciting a sort of mental exaltation, but then the mental treatment becomes a species of narcotic, and though narcotics have a distinct place in rational medicine, their employment is liable to great abuse and needs to be safe-guarded with especial care. The fact that the small boy's toothache disappears when he arrives at the dentist's door does not prove him to be beyond the need of the dentist's attention.

On the other hand, the local or general treatment, in the hands of a physician who really understands the mental needs of his patient and is prepared to use his influence in the best way, is often productive of a degree of benefit which the neurologist alone cannot secure.

The contrast between the expert mental therapeutics of the present day and that of an earlier period lies, thus, largely in the clearer definition of the objects to be sought and the steps by which these objects are to be attained. Most of the newer leaders of thought in such matters have turned aside from the inquiry, What effects can be induced by mental influences, to the study of the diseases for which these influences, among others, are of use. It will be remembered, for example, that, some fifteen years ago, a wave of revived interest in hypnotism spread over this community. Liébault and Bernheim had recently published their marvellous tales, the controversy between the schools of Nancy and of Charcot was still fresh, and a few of our townsmen had returned from abroad to show that Americans too could be hypnotized and cured of many ills. For a time the word

hypnotism was on all lips, and the list of its accomplishments grew longer day by day. Many books were published, and a number of men, some of them of great ability, devoted themselves exclusively to that branch of practice. Their experience has certainly been of the greatest value, and many of the same men are still working and publishing on the old lines. On the whole, however, there has been, I think, a clearer recognition of the fact that one cannot deal satisfactorily with "suggestion" until a great deal more has been learned of the nature of the diseases in the treatment of which "suggestion" sometimes proves a partial aid, and of late years the pathogenesis of "insistent ideas," of "multiple personalities," of hysteria, and of the hysteroid forms of epilepsy and neurasthenia, has been studied as never before.

These studies have taken the form of clinical researches of the most minute and searching kind. Through analytic case-histories, patiently recorded, it has been sought to picture the mental history of sufferers from such disorders as those enumerated, with the same sort of fidelity as is displayed in the descriptions of the anatomists.

These researches have already placed mental therapeutics upon a far more rational footing, and as time goes on their effects are sure to be more and more apparent.

The neurologist of the future will seek to treat his patients upon the basis of a broader and more intelligent study of their individual experiences and of the influences to which they have, severally, been exposed. He will try to leave each one better able to understand himself, less inclined to waste his strength in aimless self-reproaching, or to yield to paralyzing fears, and more inclined to engage hopefully and with interest in the task of successfully asserting his intelligence, his conscience, and his will. And these results will not have been attained, or at any rate it will not be sought to attain them, by appeals to superstition or ig-

norance, but by methods which reflect the true spirit of scientific research.

No attempt need be made to draw a sharply dividing line between physical and mental therapeutic agents. It is desirable, on clinical grounds, to recognize that a kinship exists between the influence that improves the nutrition of the brain by increasing the harmony and efficiency of its functions, and that which reaches the same end by improving the quality of its nutrient fluids or the mode of their distribution. With this principle borne in mind, the physician will be more apt to treat his patients from various points of view simultaneously, and not to neglect one for the other.

It seems impossible, in this brief communication, to refer by name to the men who have placed this branch of medical science on its present footing, or to refer to the attempts in the way of treatment with which I have become personally familiar. I must, however, in justice mention that the work of a number of our colleagues in Boston has contributed materially to the building up of this new branch of medicine, and has justified the placing of their names alongside of those which are so familiar to all students of the foreign literature with relation to this topic. Nor can I forget that it is owing mainly to the devotion and the skill of my friend and associate, Dr. George A. Waterman, that the winter's work at the Massachusetts General Hospital, in the Out Patient Department and in the neurological ward, has been fruitful during this past season as never before.

ARTICLE XLI.

THE PRESENT STATUS OF HYDROTHERAPY AND OTHER FORMS OF PHYSICAL THERAPEUTICS.

By JOSEPH H. PRATT, M.D.
OF BOSTON.

READ JUNE 8, 1904.

THE PRESENT STATUS OF HYDROTHERAPY AND OTHER FORMS OF PHYSICAL THERAPEUTICS.

In an admirable address delivered at the opening of the balneological course at Baden-Baden last October, Professor Vierordt* asserted that the recent introduction of physical methods of treatment marked a turning point of great importance in the history of medicine. In the past, the reluctance of scientific physicians to avail themselves of physical agents — light, water, air, heat, electricity, movement — has been in large part due to the fact that their use did not rest upon a scientific basis. They were employed chiefly by men devoid of scientific accuracy, untrained in careful diagnosis, who, not content to allow physical methods to be judged by results obtained, made extravagant claims for them and introduced, to explain their use, wild conjectures and theories unsupported by physiological and pathological evidence. Within the past decade, however, empiricism in physical therapeutics has been overthrown, and to-day the use of air, water, heat and other natural methods of cure, rests upon a firm foundation.

It is not surprising that the study of gross and microscopical morbid anatomy caused a loss of therapeutic faith, amounting in many instances to a denial of the efficacy of almost all medicines. The futility of the treatment employed was too often apparent at the postmortem table.

* Vierordt. Die Therapie der Gegenwart, Nov. 1903.

This spirit of therapeutic hopelessness is passing away. A knowledge of pathology no longer presupposes that its possessor has no interest or faith in treatment. It is true that faith in drug therapy has not increased, but the value of physiological procedures is realized more and more as knowledge of physiological and pathological processes increases and nature's modes of cure are better understood. Let me cite an illustration. The tubercle bacillus is ubiquitous, and the only reason any individual escapes infection is owing to the ability of the healthy tissues to destroy the bacilli, and the only method of cure is to increase the resistance of the tissues. Judged by a study of morbid anatomy alone, few diseases would seem more hopeless than phthisis pulmonalis. Yet everyone knows that fresh air, good food and rest cure more than half of the incipient cases, and diminish or remove the distressing symptoms from those in whom the disease is far advanced.

The interest and study given to the investigation of physical therapeutics by the leaders of medical thought in Germany is certainly a hopeful sign. This new movement has resulted in the development of a system which embraces within its scope the treatment of all forms of disease. There is no attempt to substitute physical procedures for drugs of recognized value, but to combine both methods of treatment.

The experimental method in the study of hydrotherapy was introduced by Winternitz over thirty years ago, and his treatise published in 1877 placed hydrotherapy on a physiological basis. Although it was one of the first physical methods to be granted a place in scientific medicine, knowledge of the mode of action of water upon metabolism, the circulation, the blood and the nervous system is still very imperfect. The work which was begun along proper lines by Winternitz is now being extended, and during the past year important researches upon subjects connected with

hydrotherapy have been reported in some of the leading scientific journals of Germany — *Deutsches Archiv für klinische Medizin*, *Zeitschrift für klinische Medizin*, *Ziegler's Beiträge*, *et al.*

The reason that physiological therapy has developed so rapidly in Germany is explained by the fact that its study has been undertaken with the same thoroughness and by the employment of the same critical methods and with the same scientific spirit as has characterized the work of the Germans in physiology, pathology and the other fundamental medical sciences.

Of all the non-medicinal methods of treatment, nutrition therapy, to use a term introduced by vonLeyden, has reached the highest point of development. It is the knowledge of the physiology of nutrition gained by the investigations of Justus vonLiebig, Voit, Rubner, and others, which gives dietetics the important place it now holds.

The beginnings of this new period in therapeutics date back many years. Early in the last century a method of medical gymnastics was introduced by Ling in Sweden which is used to-day. Within comparatively recent times, Gustav Zander, another Swede, devised a system of mechanical gymnastics and invented elaborate and ingenious apparatus. The Frenchmen, Junod, Tabarié and Pravaz, laid the foundation of pneumotherapy. Electrotherapy originated with Duchenne, of Boulogne, and its scope was extended by Erb, of Leipsic, now of Heidelberg. The recently developed light therapy is chiefly due to the investigations of Finsen, of Copenhagen. The compensatory exercise-therapy, so valuable in the treatment of tabes dorsalis, was introduced by the Swiss physician, Frenkel. Local hot air baths for arthritis were first employed by Bier, while an assistant of vonEsmarch at Kiel. Scientific hydrotherapy, as we have said, is chiefly indebted to the Austrian, Winternitz. Thus it will be seen that modern

physical therapeutics was developed by many men in different countries. These pioneers, isolated from one another, worked along special lines, and until recently their influence on medical practice was not great.

Some of the leaders of medicine, among whom was the honored Kussmaul, saw with almost prophetic vision the direction in which the therapeutics of the future would progress and realized the need of instructing the physicians and students of their generation in dietetics and methods of physical treatment. Eulenberg and Samuel, in their Handbook, pointed out clearly this defect in medical education, which existed in Germany as late as 1898. Much has been accomplished within the past ten years, and for this rapid development great credit should be given to Professor vonLeyden, who has utilized the commanding position he holds in German medicine to the advancement of physical therapeutics. In 1897 he published, with the collaboration of the leading authorities, the *Handbuch der Ernährungstherapie* in two large octavo volumes. This was so successful that another edition has been prepared, the second volume of which has just been issued. v. Leyden also established a journal, devoted exclusively to dietetics and physical therapy — the *Zeitschrift für diätetische und physikalische Therapie*.

Inspired by vonLeyden, his associate, Goldscheider, and assistant, Jacob, issued the *Handbuch der physikalischen Therapie*, in four volumes — an admirable work to which Hoffa, Eichhorst, Jolly, v. Liebermeister, Litten, Nothnagel, Riegel, Senator, and other well known university teachers, contributed.

At the present time, in Germany, the leaders in internal medicine are the leaders in physiological therapeutics. Nothing indicates more clearly the present status of hydrotheraphy in Germany than the fact that the three largest university clinics have recently been equipped with the latest and most approved apparatus for water treatments.

In Berlin, the University maintains a hydrotherapeutic institute at the Charité. It was opened in January, 1901, and is under the direction of Professor Brieger, distinguished for his investigations in chemistry and bacteriology. In establishing the institute, Brieger was aided by Professor Koch, a verification of the statement I have made that this new development in therapeutics appeals to the scientific mind.

Up to April, 1903, about 34,000 treatments had been given in Brieger's hydrotherapeutic polyclinic; important researches made, and nearly twenty-five papers published.* His lectures on general therapeutics were attended by one hundred and forty-five students, and three hundred and fifty-four physicians received instruction. Light, heated air, massage and mechano-therapeutic procedures are used in conjunction with hydrotherapeutic measures.

In connection with v. Leyden's medical clinic, is a department for physical therapeutics under the immediate charge of Paul Jacob, whose interesting report of the work accomplished during the past year occupies thirty-five pages of the latest volume of the *Charité-Annalen*.

The *Anstalt* for physiological therapeutics in the University Clinic at Munich is one of the most complete in the world. It was equipped by the Bavarian government at great expense. The hydrotherapeutic arrangements are unexcelled. There are facilities for full baths, half baths, local baths (arm, foot, etc.), sitz-baths combined with douches for the back, abdomen or vagina, vapor baths and vapor douches, hot-air baths, sand baths, mud baths, fango packs, salt baths, carbon dioxide baths, sulphur baths, electric baths and a variety of douches.

Several small rooms are devoted to inhalation therapy. One sees here the remarkable inhalatorium devised by Wassmuth, and other simpler systems of inhalation are also to

* Krebs. Die medicinische Woche, 1903, iv, p. 255.

be found. A large hall is devoted to mechanotheraphy, and contains twenty-two different forms of Zander's apparatus for passive and resistant movements and massage manipulations. Another room contains a Finsen light of the original pattern, and general and local electric light baths.

The great Leipsic clinic is well fitted up with appliances for hydrotherapeutic treatments, as is also Erb's clinic at Heidelberg.

Many years ago, Liebermeister built rooms in his Tübingen clinic for hot air and vapor baths. At the present time, the hot air cabinet is generally preferred to the hot chamber (Turkish bath), because in the former the patient is not compelled to breathe super-heated air, and danger from congestion of the lungs is averted. Moreover, it is easier to supply pure air and the temperature of the bath can be regulated to the needs of the individual.

Elaborate apparatus is not essential to success in hydrotheraphy. Much can be accomplished, as someone has said, with a bucket of water and a couple of towels, if intelligently applied. For over fifteen years, simple hydrotherapeutic procedures have been extensively used in Professor Stintzing's clinic at Jena, in the treatment of chronic as well as of acute disease, including severe organic maladies. That the measures employed have yielded important results is indicated by the publication of Matthes' text-book of clinical hydrotherapy, based in part upon the experiences of the Jena clinic where Matthes served as assistant for nearly ten years. This work is probably the best, as well as the most scientific that has appeared. The opinions expressed are conservative and convincing. The author is not simply a specialist in hydrotherapy, but is a professor in the university, director of the medical polyclinic at Jena, and recognized as among the ablest of the younger German clinicians.

Another indication of the important place hydrotherapy holds in German medicine of the twentieth century is the

attention given to this subject in the latest standard works on internal medicine. In the last edition of v. Strümpell's *Lehrbuch*, water treatments are recommended in sixteen diseases, exclusive of those of the nervous system. In Penzoldt and Stintzing's *Handbuch der Therapie innerer Krankheiten*, third edition, 1903, over one hundred and fifty pages are devoted to the general hydrotherapy and balneotheraphy of diseases of the nervous system.

In the summer semester of 1902, the following German universities offered one or more courses in some department of physical therapeutics, usually hydrotheraphy: Berlin, Bonn, Breslau, Erlangen, Greifswald, Halle, Heidelberg, Leipsig, Munich, Strassburg, Tübingen, Rostock and Würzburg. This makes a total of thirteen out of the nineteen universities which gave special courses on these subjects in a single half year. Compare this record with that of our American university schools, none of which, so far as I have been able to learn, gives a similar course.

In addition to the opportunities for instruction in the physical therapy of medical diseases, Ritter, of Bier's clinic, devoted a course to physical methods in surgery. During the present semester, one of the two courses given by Professor vonStrümpell, at Breslau, is limited to physical therapeutics.

Austria is the home of modern hydrotherapy. At Kaltenleutgeben, in 1862, Wilhelm Winternitz, the "father of scientific hydrotherapy," established his sanitarium for water treatments, which has increased from eighteen patients, treated the opening year, to two thousand patients in 1896. Winternitz founded at his own expense an out-patient hydrotherapeutic clinic, in connection with the university hospital at Vienna. Later he was made *ausserordentlicher* professor of internal medicine. He has given instruction in hydrotherapy to hundreds of physicians. In 1890, he founded the *Blätter für klinische Hydrotherapie*. This has become

the standard journal of hydrotherapy, and its original articles and reviews record nearly all the advances in this department of medicine.

In the model clinic of Jaksch Ritter von Wartenhorst, at Prague, are appliances for the most approved hydrotherapeutic treatments, and in the curriculum of 1904 he included, as is his custom, a two-hours' weekly course on hydrotherapy. Professor Pribram, in the same university, also offers special instruction in physical therapeutics.

At the *Spedale S. Maria nuova*, in Florence, connected with Grocco's medical clinic, is an institute for physical therapeutics which compares favorably with any in the world. According to Baruch, it possessed in 1900 the best douche apparatus in Europe. At the time of my visit, two years later, the establishment was supplied with the latest appliances for other forms of physical therapy. It was interesting and significant to note that the equipment was of Italian manufacture.

In Rome, an institute devoted to physical therapy has recently been opened which is complete in its appointments. The architect of the palatial building, with a true artistic sentiment, caught the spirit of the movement, and the classic style adopted not only gives the Institute the character of a public building, but permits the entrance of the largest possible amount of sunlight. The director, Professor Colombo, holds an academic position in the University of Rome and is editor of the *Revue Internationale de Therapie Physique*.

Practical hydrotherapy developed more rapidly in France than in any other country, and has for many years been held in high repute by leading clinicians. Fleury, a member of the faculty of medicine of Paris, introduced the douche, which is the most valuable of all hydriatic procedures in chronic disease. His excellent *Traite d'hydrotherapie* reached its fourth edition as early as 1875.

Charcot used hydrotherapeutic measures constantly in his practice. Probably the best presentation of the douche treatment, which is known as the French method, is to be found in the manual of Beni-Barde and Materne, published in Paris in 1894.

In England, hydrotherapy has scarcely gained a foothold. Dr. Calvert, warden of St. Bartholomew's Hospital, told me he knew of no institution that had any special equipment for this form of treatment. The facilities for light therapy, however, at the London Hospital are admirable. Three of the original Finsen arc-lights have been installed, and a number of small lights of the French pattern. This movement was inaugurated by Queen Alexandra. Over a hundred cases of lupus receive daily treatment. The Röntgen rays and Tesla coil are also used.

Even hydrotherapy, in acute diseases, has made little progress in Great Britain, although it was early advocated by Wilson Fox and Ord. The leading champion of the cold bath treatment in typhoid fever has been Cayley, who, in the Croonian lectures for 1880, clearly and convincingly set forth its advantages.

Strange it is that the land of Currie, whose teachings influenced Brand, should be the last to adopt the cold water treatment in typhoid fever. There is some evidence, however, that the clouds of prejudice are being swept away. In the typhoid fever number of the Practitioner, published in January, 1904, Dr. J. W. Moore, in discussing the treatment, says that "in the water treatment alone have we a safe and certain means of controlling, or even reducing temperature, in the febrile state," and in another paper, contributed to the same journal, Dr. Hawkins states that for "controlling pyrexia there is nothing like cold water."

Mention should be made of the excellent Journal of Balneology and Clinatology published in England, to which the distinguished clinical physiologist, Oliver, has contributed valuable articles.

The modern cold bath treatment of typhoid fever was introduced into America and first systematically used by a Fellow of this Society, Dr. R. T. Edes, who honors us with his presence to-day. In 1875, he presented at this annual meeting an able and scholarly paper, characterized by its philosophical tone, in which he described the work of Brand, Ziemssen and Liebermeister, and reported that he had used the graduated cold full bath with friction since 1872 in sixty-six cases of typhoid fever. Of thirty-two patients treated from the first week of the disease, only one died. The pity of it is that the generation to whom he announced this was so blinded that it could not see the truth. Think of the lives needlessly sacrificed in Massachusetts alone since 1875, because Dr. Edes' advice was not heeded, — not the old and decrepit, but those in the vigor of early adult life. The cold full bath is certainly a heroic method, but it should be used because it saves life. Since July, 1890, hydrotherapy in typhoid fever has been practiced by Dr. Osler at the Johns Hopkins Hospital, with a reduction in the death rate to seven and a half per cent. Equally good results have been obtained by Gilman Thompson in New York and J. C. Wilson and Tyson in Philadelphia.

In this country, the value of hydrotherapy in chronic diseases has been specially emphasized by Kellogg and Baruch, and it has been used by Dr. J. J. Putnam for over twenty years.

The first modern work in the English language dealing with hydrotherapy and untainted with quackery was Winternitz's monograph in Ziemssen's Handbook of Therapeutics, which was translated from the German in 1884. In 1892, Dr. Baruch published a short but excellent work on the "Uses of Water in Modern Medicine." Later his larger treatise on hydrotherapy appeared. Recently the second edition was issued, which shows not only that the book has been well received, but indicates an increasing interest in hydrotherapy among physicians.

Kellogg's "Rational Hydrotherapy" appeared in 1900. Although a large and expensive work, it has already reached a second edition. It is most comprehensive, and its descriptions of technique are worthy of special commendation.

A system of physiological therapeutics, in eleven volumes, edited by Solis Cohen, has just been completed.

The douche treatment is the most efficient form of water treatment in chronic disease, and its action is the most varied. Baruch, who has always insisted, and rightly so, on precision in method, devised an excellent douche table, which permits exact regulation of pressure and temperature. Douche apparatus has recently been installed in a number of hospitals in this vicinity, including the McLean Hospital, the Danvers Asylum, the New England Hospital for Women and Children, Dr. Millet's Sanitorium at East Bridgewater, the Butler Hospital at Providence, and our own Medical Baths in Boston. Dr. Blumer, of the Butler Hospital, says in his last annual report that "Hydrotherapy has been so productive of results that our baths are now used far beyond their capacity."

Dr. Baruch has established a hydriatic department at the Riverside Baths, in New York, to which physicians and dispensaries refer cases. The number of patients treated has risen from 2,146, in 1895, to 16,012, in 1902, — incontrovertible evidence, as Baruch says, of the increasing appreciation of the value of hydrotherapy. As a result of the efforts of Dr. J. J. Putnam, assisted by medical men and laymen, a hydrotherapeutic institute, with facilities for all forms of hydrotherapy, owned and controlled by physicians, has been established in Boston, to which any physician may send patients. Although only opened seven months ago, the support given and the results obtained have been most satisfactory.

Baruch's douche apparatus is not the only invention American medicine has given to physical therapeutics. In

1891, Kellogg, of Battle Creek, devised the electric light bath, which, although in constant use to-day, in the well-equipped clinics of Europe, remains almost unknown to American physicians.

As early as 1893, Dr. Peterson, of New York, urged that some of our medical schools give instruction in hydrotherapy. It is encouraging to read in the last annual announcement of the Cornell Medical School that to the students in small sections "will be demonstrated the various applications of water to the treatment of disease — such as baths, packs, douches, etc."

Among hospitals well equipped for other forms of physical therapy, the Royal Victoria, of Montreal, should be mentioned, which has excellent apparatus for electro-therapy. The facilities at the Boston City Hospital for X-ray therapy and the pioneer work of Dr. F. H. Williams are well known. No hospital in the world has so complete a set of Zander apparatus, numbering sixty-three pieces, as is to be found in the new department of mechano-therapy of the Massachusetts General Hospital.

From this brief sketch of the position hydrotherapy and other physical treatments occupy to-day, it is evident that this branch of medicine has attained a much higher stage of development in Europe than in America. It is a subject certainly worthy the attention of our leading clinicians, and it is to be hoped that our large hospitals, so excellent in other respects, will soon have facilities for physical therapy that will compare favorably with those of Germany, and that the facilities will be as intelligently used. But in order to insure the intelligent application of physical agents, it is necessary that instruction in physical therapeutics should be given in our schools.

DISCUSSION.

Dr. J. J. Putnam, of Boston: These two papers are certainly very timely, and will be of great service. I shall not attempt to say anything about the scientific aspects of hydrotherapeutics, but simply of the efforts that are being made to place this means of treatment at the service of physicians in this city. Of course much can be done with simple means, but for many purposes an institution is needed, and such an institution we now have at 126 Massachusetts Avenue under the charge of Dr. Pratt and an informal committee of physicians.

Of course such an institution is very expensive, and without outside aid we could not have fitted up the rooms and obtained the necessary apparatus to carry on the work successfully. Our small establishment is now on a good footing, except that we still need the support and interest of physicians, and funds for the introduction of further apparatus.

Dr. G. T. Tuttle, of Wellesley: We have been using hydrotherapeutics in some form at the McLean Hospital since the spring of '97, and in order to employ it to the best advantage I have tried to ascertain what it really did for our patients, since it seemed to me that rather extravagant claims had been made for it. The effect desired was chiefly stimulating or tonic, and great care has been used to secure a good reaction; that is, a permanent return of blood to the surface vessels after cold applications. The problem has been to adapt the temperature of the water, the pressure under which it is delivered, and the time of its application to the strength of the individual so that this reaction may be as perfect as possible. Patients differ in regard to their ability to respond, and there is also a variation in the same person at different times; even healthy people should use caution in taking these baths when they are tired. The neurasthenic, if the bath is too vigorous, complains of exhaustion, which seems to contradict the claim that these baths increase the capacity for work. To determine whether this is so, a series of experiments has been conducted with the use of the ergograph with practically negative results.

We could not obtain fatigue curves showing the great increase in work done after the bath that has been recorded by others. Observations on the pulse rate, respiration and temperature during the various stages of an ordinary bath show that they all vary directly with the temperature to which the individual is subjected; while the blood pressure varies inversely with the temperature, — hot applications lower it, cold applications raise it. The sudden fall of blood pressure is no doubt the reason why some people faint while in the hot air cabinet.

Considerable importance has been attached to the fact that some observers have found a large increase of red and white cells in the blood after various hydriatic procedures. We have been unable to confirm this, and, in my opinion, any increase of cells in the surface vessels after cold baths is purely a local phenomenon, and a disadvantage if long continued.

Theoretically, cold applications to the entire surface of the body at once should cause a flushing of the internal organs and an increased activity. Observations have been made by Dr. Otto Folin in our laboratory to determine whether such baths as we give really cause any increase in destructive metabolism of the body, with practically negative results.

The wet pack has been found extremely useful in cases of exhilaration or excitement for its soothing and even hypnotic effect.

While I have been unable to confirm many claims made for hydrotherapeutics, there are, in my opinion, many and sufficient reasons for its use.

Dr. R. T. Edes, of Reading:—There have been several points in these papers which have interested me very much, and I am glad that they were read together, as Dr. Millet's shows that a very efficient use of this highly important agent can be made without complicated and expensive apparatus.

Dr. Pratt's paper, in its very thorough treatment, gave one the idea, although he did not exactly say so, that hydrotherapy is quite a recent introduction in Germany and that it was introduced into this country by Dr. Baruch.

In a report on Therapeutics for the Boston Medical and Surgical Journal, 1872, I quoted from German authorities

statistics on the subject, and in 1875 I read to this Society a paper based on my experience of three years at the Boston City Hospital on the "Treatment of Typhoid by Cold Baths." This was published in the Boston Medical and Surgical Journal and in the Second Series of the City Hospital Reports. Of course the subject is growing and developing. Much elaborate apparatus has been devised and the scope of its application much extended. Probably it is more scientifically understood but it is not absolutely new here.

Dr. PRATT:—Certainly, as Dr. Edes says, the use of water in the treatment of disease is no new thing. Probably no therapeutic method is of greater antiquity. I regret that I failed to make it clear that I was dealing only with the development of scientific hydrotherapy. Baths as a curative agent were highly valued by Hippocrates. Galen considered cold water most important in fever, as did Celsus, Avicenna and Rhazes. But the origin of hydrotherapy on a physiological basis dates from the work of Winternitz in the third quarter of the last century.

Over a hundred years ago the distinguished New York physicians Samuel Bard and David Hosack, following the teachings of Gregory of Edinburgh and Currie of Liverpool, used cold sponging in the treatment of fever. Somewhat later Nathan Smith of Yale College employed with success cold water in typhoid fever. But the influence of these men soon ceased to be felt and water as a curative agent was forgotten, and hence this period has but slight historic interest and played no part in the development of the hydrotherapy of to-day.

It is certainly not generally known that the modern cold water treatment of typhoid fever developed in Germany by Brand, Ziemssen, Jürgensen and others, was introduced into America by Dr. Edes. I shall take pleasure in giving him deserved credit in my published address.

ARTICLE XLII.

THE PRACTICAL APPLICATION OF HYDROTHERAPEUTIC MEASURES.

By CHARLES S. MILLET, M.D.
OF BROCKTON.

READ JUNE 8, 1904.

THE PRACTICAL APPLICATION OF HYDROTHERAPEUTIC MEASURES.

It will be my purpose, in the short time that I shall detain you, not to discuss *all* the hydrotherapeutic procedures, but only those with which I have had a personal experience. These procedures, like so many other things in medicine, are at first perplexing and seem well-nigh impossible in private practice; but if they are analyzed a little, and one begins to use them, he will soon find that their application is as simple as it is effective.

The skin contains far more nerves, bloodvessels and glands than any other organ; in fact, so numerous are the bloodvessels that it is said that they will hold half of all the blood in the body. Its function is to convey impressions to the brain and other nerve centres, to carry off waste products and to regulate body heat. In other words, it is the organ of sensation, the next most important sense to that of sight. It is a powerful excretory organ, sifting out from the blood carbonic acid gas, various other products of metabolism, and water, in which enormous quantities of pathogenic bacteria have been found.

The heat of the body is produced by the combustion of non-nitrogenous substances, chiefly in the muscles, and it is given off by perspiration and radiation from the cutaneous surface.

Hydrotherapy, then, has to do with sensation, excretion and heat radiation, and if we could only keep these facts in

our minds when applying this sovereign remedy, the application would be much easier; it would be oftener made; and the results would be more satisfactory.

Of course, in endeavoring to influence any one of these three functions it is impossible not to affect the others to a greater or less degree; but at the same time, it is not at all difficult to so use water as to vary these impressions and cause the one most desired to become prominent.

Furthermore, by applying water to the skin at various degrees of temperature and in various ways, we can, through reflex action, produce decided effects upon the mind, the central nervous system and all the internal organs.

Let us first consider the treatment of fever, which is largely, if not wholly, due to diminished heat radiation; there is nothing that will produce quite so much perturbation in the average medical mind as an excessively high temperature. The personal experience of any man who has been twenty years in practice must have carried him through a disappointing period with so-called antipyretics,— the principal one used being acetanilide, I fancy. I well remember a case of typhoid fever, in which the temperature reached 105 degrees before the end of the first week, that I treated with large doses of this drug, some fifteen years ago. The medical magazines at that time were teeming with articles, telling of the efficacy of these coal-tar preparations.

Convinced by the brilliancy of the results claimed, I proceeded to give it on alternate days, and in liberal doses. The effect upon the temperature was as marvellous as it was temporary; but the resulting anæmia and peculiar lividity were most distressing. And when Dr. Fitz, whom I called in consultation, wondered at it, I must confess I did not dare to tell him how heroically I had dosed the young woman,—for I had not forgotten his method of showing us our mistakes in the class-room, and I feared he might use it here, the cause was so just.

The reign of drugs in the treatment of fever was, as you all know, very short, and we soon began to hear of Brand and the remarkable results which he had obtained by the use of cold baths in typhoid; and while the idea has been very generally accepted, and its great value acknowledged, yet I firmly believe that his method of using water is so often modified that it would be very hard for the originator to recognize it. The so-called "typhoid bath" of to-day usually consists of sponging with cold water; and while this is quite sufficient when the temperature is not over 104 degrees, any rise above that is not properly treated unless the tub, with friction while in the water, is used. On the other hand, it is to be remembered that reduction of temperature is by no means the main object in view, yet the strengthening of the heart and the calming of the nervous system are not obtained without a gradual fall in this respect.

In any given case, the use of water must be in the nature of an experiment, but failure to produce marked signs of improvement must not deter one from persisting; but rather should cause deep thinking, lest a measure far more productive of good than drugs shall be neglected. Take for example, a case of scarlet fever which I once saw,—a strong, rugged girl of sixteen, so large and well-developed that she looked twenty; there were other cases in the family, so that when she was taken sick, it seemed very probable that it must be the same disease; the trained nurse had just taken her temperature when I went in, but said nothing. Placing my hand upon the patient, I found the skin quite cool and said that I did not consider her very ill, whereupon the nurse showed me her thermometer, which had registered 106 degrees; and then when I counted her pulse, I found it to be 140. The extremely high temperature so startled me that I neglected to consider the other symptoms and cold sponging was ordered; the next day exactly the same condition was found,—the skin was cool, but the temperature

and pulse were very high, and again the same mistake was made, the belief that the temperature must be reduced being paramount; and a more persistent application of cold baths was insisted upon. And so, on a third day there was found to be no change. It then dawned upon me that something else must be done if that girl was to live, and the nurse was told to wrap her up in a hot, wet sheet,—or in other words, to give her a hot pack.

The result was so remarkable as not to be forgotten; the eruption, which had been delayed, almost immediately appeared, and the pulse and temperature rapidly fell to not much above 100. The explanation is, apparently, that the bloodvessels in the skin were so irritated by the poison of the disease as to be in a state of tonic contraction, so that the application of cold had no effect upon them.

Spencer says that *science* is nothing but common sense, systematically and thoroughly applied. Therefore, one can use a little here, and be guided by the condition of the patient, in determining whether the water should be hot or cold; its application long or short, and with or without force. If the pulse is high in tension and full in volume and the skin hot, a cold bath will produce better results, even though the patient cries out against it; I have seen a boy of five scream frightfully for ten minutes, every four hours, for days when the nurse gave him a cold bath, then dropping off to sleep almost immediately, his temperature and pulse being perceptibly improved thereby, in spite of his fright.

If it is true that the heat of the body depends upon and is regulated by the action of the skin, and is kept at a normal degree by the automatic working of this organ, and if it is true that an abnormal rise is in every case due to an impairment of this action, then certainly in hydrotheraphy we have a method with which we can at will influence enormously one of the most important functions of the body.

To reduce fever, three kinds of baths are used: that with a sponge, — the water containing perhaps alcohol or soda; the cold bath, either in a tub, or in bed with a rubber sheet; and the warm bath, gradually reduced. The question is, of course, what shall determine our choice; to which, the answer is,—*experiment*; it does not matter which, so long as a good reaction is obtained. Long before any damage can be done to the patient, his own senses or the observation of his nurse, no matter how inexperienced, will give the desired information.

The sponge-bath will do for febrile conditions not severe enough to cause any anxiety, and which will evidently be of short duration. But any infectious fever which is at all severe, is certainly poorly treated if a full tub-bath, — or a bath in bed, with lots of water and friction, — are not employed. In order to obtain the confidence of the relatives, is is well to begin with a bath at 100 degrees, and run it down to 90, in about ten minutes; the head should be wrapped about with a cold, wet towel, or the patient will be liable to faint. This is an excellent bath to give a child who has bronchitis, pneumonia, measles, or any other acute infection; and if it is not effective in producing sleep, the temperature of the water should be reduced two or three degrees every three or four hours. If no bath tub is available, an ordinary wash boiler or wash tub is a good substitute. But in a severe case of acute febrile disease in an adult,—of which typhoid fever might be called the type,— it will be necessary to use cold water, which is again mentioned in order to emphasize the point that unless friction is used with it, there is liable to be little or no reaction. The term "reaction" is so often heard in connection with hydriatics that a definition of it might not be out of place; a perfect physiological reaction takes place when the blood, having been driven out of the surface, is caused to return with redoubled energy. In other words, the restoration of

heat after heat abstraction is the one thing essential. If the blood is not in the cutaneous vessels to begin with, it is necessary to first apply heat; if one realizes that the nerve filaments which convey the sense of cold act like lightning, while those which carry the heat sense act more slowly, it is very easy to understand why it is so often necessary to apply the latter for the long period; and why, when warmth is alone used, the reaction appears only after a time. Often this is desirable,—say, when one wishes to produce sleep and does not care to arouse the nervous system. But sometimes it is impossible to produce rest and quiet without stimulating the nerves. Such a condition is present in melancholia or acute mania, which it has been my good fortune to see greatly helped by means of bathing. Here the patient should be set in hot water and a pailful of cold should be quickly and forcibly thrown over the shoulders. It is truly marvellous the way an extremely restless patient will quiet down and go to sleep after such rigorous treatment. Such cases, too, almost always refuse to take medicine; and if they do not, the hypnotics are ineffective except in lethal doses. *It is neither difficult nor dangerous to give baths.*

The hot wet-pack is relied upon by most physicians in eclampsia, and in fact whenever the kidneys are blocked or diseased. But the result obtained is not so much due to vicarious action, as it is to the withdrawal of blood from the internal organs. If used continuously,—I mean day after day,—in chronic Bright's disease, it is better to supplement the heat with a short, quick, cold affusion, and rubbing.

The water poultice is very beneficial in pneumonia, and in all acute pulmonary affections. This is made of three layers of old linen, which are rung out of cold water and wrapped around the chest, and then dry flannel is placed outside of that. This should be wet as often as it gets warm.

Chlorosis, secondary anæmia, chronic, pulmonary and organic heart diseases have all been decidedly benefited by systematic bathing. In these it is advisable to first produce warmth to the point of perspiration,—either with a hot air cabinet, or, better, by a sun bath,—and then to give the patient a warm shower, and to follow that with cold water through the hose. If possible, perambulatory cases would better be treated at a place where medical baths are given,—for a limited time, at least,—after which, if necessary, the treatment can be continued at home. If the physician would go with his patient and see him take a bath, in the Institution which Dr. Putnam and others have so generously placed at our disposal, he would very quickly discover that there is something in hydrotherapeutics other than charlatanism.

The local application of heat and cold acts on the part treated in a similar manner as the full bath does on the whole body. If a joint or muscle is very hot, apply ice; but if the disease is of a subacute nature, and the circulation and function impaired, first apply heat, and then cold, perhaps with gentle friction. Ice is too often used to need more than a passing word. It is certainly the best substitute for opium, but should not be used constantly, because it will finally cause paralysis of the vaso-dilators. I do not think it is applied over the precordia with the frequency that it should be; placed here, its effect is exactly like digitalis; and the beauty of it is, that it acts with great rapidity; that it has no cumulative action; and that it does not disturb the stomach. In cases of collapse or shock, it is as important to put an ice bag over the heart, as it is to apply heat to the extremities; and how often is it done? Ice, over the epigastrium, will greatly relieve the thirst which follows abdominal operations.

As I said in the beginning, my remarks have been in the nature of a personal experience; and with an apology for

the crudeness and cursory way in which I have treated the subject, I will close,—adding an urgent solicitation that you will give a remedy which is as powerful as it is harmless, the confidence which it deserves. Certainly the skin, by which we are in close communication with the central nervous system, the heart, and in fact all the internal organs, should never be neglected; and half-hearted care and attention are worse than absolute neglect, because they deceive the physician himself.

ARTICLE XLIII.

OPERATIONS ON THE STOMACH, WITH REPORT OF CASES.

By JOHN C. MUNRO, M.D.
OF BOSTON.

READ JUNE 7, 1904.

OPERATIONS ON THE STOMACH, WITH REPORT OF CASES.

THE bulk of the work reported here has been done within the last year by Dr. Bottomley and myself at the Carney Hospital; but I have included all of my own cases of operation upon the stomach from the very first, although the earlier operations were done with much less confidence in technique and with a bad prognosis in many instances. Frequently patients were turned over to surgical care after having tried everything in the way of internal medication, with the feeling in the medical attendant, the surgeon and the patient that the knife was offered as a last resort. The earlier cases were, so to speak, filtered through medical hands. Latterly this has been done away with to a certain extent, because we are able to control our own clinic much more independently and the patients are referred to us directly for the decision whether surgery can offer relief or not. If we did not have the convincing end results of surgeons of large experience, like Mayo, Mikulicz, Robson and others, I should hesitate strongly about reporting so many recent cases. We do know, however, from the experience of these surgeons, that in cases of chronic ulcer, mechanical stasis and cancer, operation offers the best outlook at the minimum expense, and I feel confident that a good proportion of our temporary successes will abide, provided we have utilized properly the technique that has proven of benefit up to the present time. Time is necessary to establish the value of any method of treatment, and

in the earlier applications over enthusiasm and ill-trained judgment serve to weaken the virtues of any form of therapeutics. We must be willing to modify and change our surgical treatment of ulcers, dilatations and carcinomata of the stomach as the need is demonstrated. But meanwhile surgeons must continue sifting and rejecting, reporting and analyzing their failures as well as successes, just as they still do with their cases of appendicitis, gall stones, hypertrophied prostates, etc.

Last year, in a short plea made before the Medical Section of this Society, I begged that there should be a closer co-operation between the medical attendant and the surgeon, early in the progress of these cases; that for the patient's benefit, if for nothing else, he should be allowed to have an opinion from the surgical point of view. I am happy to state that I believe this plea has borne fruit in spite of the fact that our malignant cases still come too late for anything more than temporary relief.

I do not feel that surgery, or at least my surgery, has more than begun to solve the problem in the treatment of stomach diseases, and a perusal of my cases will convince you that there is much that has discouraged me throughout; but I believe a closer analysis will not place the odium for all our failures at the surgical door. In reporting the unsatisfactory results I have attempted as impartially as possible to fix the blame — if the term is not too harsh — where it belongs, whether on my own shoulders or those of the reluctant medical attendant, or on the attitude of the laity in general towards seeking surgical relief. In spite of a case now and then that does not prove as satisfactory as we should like, both Dr. Bottomley and I feel that we are steadily nearing the point where we can judge what cases are to be discouraged as useless surgical risks, and what cases can be assured of temporary or permanent relief. The risk from operation is lessening with experience and

with selection of cases earlier in the course of the disease, until now I firmly believe that we can offer at least a gastroenterostomy with no more risk to life than in the case of an interval appendix. I will frankly acknowledge that in several instances I have limited operation to a gastroenterostomy, through timidity, rather than undertake a more radical procedure. The feeling of this community has been so strongly opposed to surgery of the stomach that it has seemed of the utmost importance, first of all, to establish firmly in the mind of the medical confrêre that his stomach cases will not die under operation. If we can advance a little farther and establish in the mind of the general practitioner that the risk to life in any of the accepted types of operation is small enough to be disregarded, when placed in the balance with the risks and the suffering that go with the so-called conservative treatment, we shall feel that the work has not been in vain. Moreover, the pathology of the various gastric lesions, as Mayo and others have pointed out, must be learned on the living at operation and not on the cadaver. All the time that we have been, so to speak, feeling our way, we have observed and noted the various conditions found at operation, hoping that eventually we can associate clinical symptoms with the operative findings.

It is a serious and embarrassing commentary that scarcely a single case of carcinoma in our series has sought, or been driven to seek, surgical aid until it was too late to attempt radical cure. There is no valid excuse nowadays, with the clear-cut, splendid work of men like the surgeons named above, for the medical specialist to turn over his malignant cases, when far advanced in disease, with the apology that the laboratory failed to demonstrate a malignant process, at the time when an exploratory operation, as harmless as any major operation can be, would have definitely and accurately established a diagnosis.

It has been pathetic, in some cases, to have patients with-

held from operation by the supposed absence of cancer, because of the presence of hydrochloric acid, when a calm consideration of the clinical symptoms would and should have indicated some serious lesion.

In many other cases what can we say? A patient is treated for months or years for a mechanical obstruction, by lavage, medicines, diet, etc., never with more than partial, temporary relief, only slowly and insidiously to develop a malignant growth, to be turned over to the surgeon long after it is too late, robbed of his money, strength, time and courage. Then if operation is done as a last resort and the patient dies, surgery receives all the blame.

The bulk of patients seeking aid of the medical practitioner and the stomach specialist are medical, and not surgical, from first to last. These are the dyspeptics from alcohol, dietary errors, worry, etc., and they can all be cured far better in any way than by surgery. When we consider the ulcers, acute and subacute, it is probable that a good proportion can be, and are, cured by proper medical care. When, however, we come to relapsing or chronic ulcers I believe that, in the long run, surgery will offer a better outlook, with less suffering, time and expense than can be obtained by prolonged internal treatment, limited diet, etc. In the grave cases of hemorrhage, the results of men of larger experience, like Moynihan and others, indicate that in all probability surgery can do more, and with greater safety, than the time-honored treatment so much used at present. Of perforations, there is no room for argument in the matter of treatment. The possibility of perforation of both gastric and duodenal ulcers should be much more before the general practitioner's mind when treating patients with acute abdominal pain.

I have carefully avoided discussing technique in reporting the cases. The best method applicable to each individual case is far from settled and it cannot be settled satisfactorily

for many years. The internist must be content to let differences in methods be settled by the surgeon, meanwhile resting assured that, although there is much remaining to satisfy him, the simplification and the results are as steadily improving as is possible, and the results as shown in relief of suffering are steadily growing more satisfactory. In malignant cases we have used the Murphy button for the most part, but in other cases, where speed is of less importance, the method with clamps and suture as published by Moynihan has given satisfaction. Gastroduodenostomy by Finney's method we have liked also, but as we grow more proficient in our technique, and what of is more importance, as soon as the general practititioner realizes that stomach surgery is not as serious or fatal as the text-books describe, I believe that the radical operations will be much more in vogue where now we resort to a simple anastomosis. Indeed I am convinced of this in spite of the occasional discouraging failures.

No attempt has been made to report the chemical analyses of our cases. In quite a number careful and elaborate examinations were made, while in others only simple tests were used. Until we can collect a large series of several hundreds of analyses made by the same methods and under practically the same guidance, I believe that the discussion of tests made, as in our patients, by many different examiners and under very varying conditions, is only futile. I have tried, first of all, to demonstrate the clinical history just as the general practitioner would obtain it, testing the size, motility aud acidity of the stomach, which can be done without elaborate apparatus. By comparing these clinical symptoms and the clinical histories (brief though they may be, but notwithstanding, so often very poignant) with the condition found at operation, I believe we can form some judgment in future as to the actual condition of the viscera before operation.

The cases that have but little interest to us in this report consist of four operations for stricture of the esophagus, three of which were carcinoma, and one, a gumma. Two patients were operated on for perforating wound of the stomach, with one recovery. Two cases were explored, one for a supposed foreign body. The other was a man of 46 who had had a gastroenterostomy done by Dr. S. J. Mixter, with a McGraw ligature, in Aug. 1902. Following this operation he was well for six weeks, then his pain and vomiting returned. Often he would go for a week without vomiting, then would throw up food that he had eaten 24 hours previously. On the supposition that the gastroenterostomy opening had closed, I reopened the abdomen and found an edematous condition of the omentum. On the stomach on the anterior surface the artificial opening was clear and easily admitted the finger. The stomach had been drawn down into a funnel shape and was apparently draining perfectly into the jejunum. There was no sign of constriction or of impaired drainage. The gall bladder was covered with adhesions and was not palpable. Exploration elsewhere was negative. As there seemed to be no indication for further interference, the abdomen was closed.

Two cases were admitted with an undoubted clinical history of gastric ulcer, but both refused operation and they have not been heard from since.

Of the malignant cases, ten were explored and the condition was found too far advanced to allow radical operation or there was not enough indication of pyloric stenosis to warrant a gastroenterostomy. These cases were closed at once and were discharged from the Hospital as quickly as possible. In detail they are as follows:

No. 11, male, 52. Referred by Dr. V. Y. Bowditch. Dyspepsia for a year, with occasional attacks of severe griping pains, for which morphia was given. No vomiting, but some relief from eructation. Test breakfast at the hands of a specialist showed no evidence of carcinoma. He

was sent abroad for his health, but derived no benefit from the trip, vomiting more or less while he was in Europe, and at that time he noticed retained food in the vomitus. He then regularly produced vomiting to relieve his stomach of retained food. He recently had lost a good deal of weight and strength. He was much emaciated and cachetic. Slightly to the right of the median line, in the epigastrium, was a hard movable tumor of the size of a hen's egg. He was put at once on rectal feeding for a few days and his condition improved somewhat.

Operation showed a hard growth about 2 in. in diameter in the greater curvature, extending toward the pylorus, but apparently not originating there. There were nodules in the omentum and colon, both of which were closely adherent to the stomach. Posteriorly the meso-colon was rough and nodular and likewise the major portion of the posterior stomach wall was studded with small metastases. Anteriorly the lymphatics, radiating in all directions, were filled with the growth. No nodules were found in the liver. As the case was hopeless, the abdomen was closed. The patient was in good condition at the close of the operation, but in the course of an hour his pulse rapidly failed and he died 12 hours later.

No. 12. Male, 70. Entered the City Hospital in Aug., 1896.

Two months before that he began to complain of constipation, soon followed by vomiting once or twice each day, which had continued ever since, and marked loss of weight. He was cachetic, very thin, and below the costal border a small, hard, round mass could be felt.

Operation showed malignant adhesions of the omentum and stomach and a hard, round ulcerating tumor of the pylorus, with dilatation of the stomach and malignant retroperitoneal lymph nodes. As the patient was too sick to warrant any further interference the abdomen was closed, and he died two days later, vomiting continuously. No autopsy.

No. 13, Male, 50, entered the City Hospital in April, 1898. Ten and six years before he had had hemorrhages from the stomach. At one time he used alcohol to excess,

but had been temperate for the last five years. Seven weeks before entrance he developed pain, which was relieved by taking soft food. There was soreness and a feeling of pressure over the sternum. For a year he had had soreness across the abdomen and had noticed a feeling of resistance in the epigastrium. Three weeks ago he observed a distinct lump. He was losing strength. A hard tumor the size of a base ball could be felt in the epigastrium.

Operation showed adhesions of omentum and intestines to the liver and deep structures. At the posterior wall of the stomach over the pylorus was a malignant growth closely adherent to the posterior wall. Numerous nodules in the liver the size of a walnut. As the case was hopeless the abdomen was closed, and the patient died two weeks later of gradual failure.

Autopsy showed carcinoma of the posterior wall of the stomach, the nodules in the liver being due to cirrhosis, not to carcinoma.

No. 14, Male, 27 years old, entered the City Hospital in July, 1902.

He had had an irritable stomach since the preceding February, marked by diffuse epigastric pain after meals, increasing in severity recently. He had vomited only a few times. Twice he had vomited a small quantity of reddish-brown blood, which the patient thought was fresh. Blackish, constipated stools. For three to four months a tumor had been developing in the epigastrium. For several weeks recently, throbbing of the tumor had given the patient annoyance, as he lay on his right side or on his back. He had lost weight and strength and had grown very anemic. Four weeks ago, after a period of severe constipation, he had severe abdominal pain, which at the time was diagnosticated as rupture of the stomach with a local peritonitis. At entrance he had only 30% hemoglobin. In the epigastrium there was a flat, circular, sharply circumscribed tumor, movable, very slightly tender. Under rectal feeding he improved steadily for about four weeks, although at no time did it seem safe to make even an exploration on account of his intense anemia. The hemoglobin increased up to 45% and his appetite improved so that he was able to take a fair amount of nourishment by mouth. As soon as it seemed

safe to explore he was given ether, and a large nodular tumor adherent to the anterior wall was found too extensive for any attempt at radical cure. The wound was closed and the patient was able to return home to Philadelphia in the course of a week, where he died some weeks later. Examination of specimen removed showed it to be sarcoma.

No. 15, Male, 48, entered the City Hospital in April, 1903.

For five weeks he had had constant pain in the epigastrium with persistent nausea. He had lost weight and strength and twice had vomited a moderate amount of dark granular material. There was a tumor mass filling the epigastrium to within two inches of the umbilicus, and disappearing under the costal margin on either side. The surface was irregular and dull to percussion.

Operation showed two groups of malignant nodules in the right hepatic lobe, one in the median line and the other in the right flank; a third in the left lobe. In the posterior wall of the stomach was a large mass the size of a small fist, merging into a sausage-shaped tumor lying along the greater curvature. The pylorus was free and open and the stomach not dilated. The wound was closed and the patient was discharged, temporarily relieved, in 11 days.

His later history has not been obtained, but death must have followed quickly.

No. 16, Female, 29 years old, referred to me by Dr. M. W. White.

Two years before I saw her she began craving food, with immediate relief on eating. There was no definite dyspepsia at that time. By the end of five or six months she lost her appetite and the abdomen felt full at all times. No vomiting but eructation. Six months later — that is, a year before I saw her—she began to lose weight and had lost about 60 lbs. One week before I saw her she vomited for several days, but without blood in the vomit. The vomiting usually came on two hours after eating and consisted of undigested food. No history of blood in the stools. She did not complain of pain, but of a feeling of pressure; otherwise she felt perfectly well. No history of early ulcer could be obtained. There was a well-marked tumor in the epigastrium, moving with respiration.

At operation, in July, 1903, at the Carney Hospital, the anterior wall of the stomach was found to consist of a broad, flat mass of carcinoma, extending up close to the esophageal opening. There were metastases in the omentum. As there was not enough normal tissue in the anterior wall to make an artificial opening, the wound was closed and the patient was discharged in 10 days, unrelieved.

No. 17, Male, 64, referred by Dr. M. P. Smithwick. He gave a history suggesting a relapsing ulcer for a period of many years. Recently he had had vomiting, with loss of strength, and blood in the stomach washings. Hydrochloric acid was present a month or so before I saw him, but on recent examination this had disappeared. For several months he could keep nothing on his stomach, vomiting immediately after eating, liquids as well as solids. He complained of pain most of the time and had been too weak to work for several months. He was emaciated, with some tenderness in the epigastrium and an indistinct nodule.

At operation at the Carney Hospital, there was an excess of serum in the cavity. Over the parietes, and through the omentum there were numerous miliary nodules of carcinoma. In the stomach was a tumor the size of an orange, in the anterior wall and greater curvature just below the esophagus, with infiltration extending up to the diaphragm, and along the greater curvature and anterior wall. Adhesions also extended over to the spleen. The wound was closed and the patient discharged, unrelieved, in eight days.

He lived for about two months, and at autopsy carcinoma of the stomach was found.

No. 18, Male, 63. Referred by Dr. Stack. Entered the Carney Hospital in Aug., 1903. His mother had died of cancer of the stomach.

For several months he had complained of gas in the abdomen, which produced severe enough colic to keep him awake at night and he had cut down his diet practically to thin gruel. Pain came on about one half hour after eating. He had had no nausea; no hematemesis. He himself noticed a tumor two weeks before I saw him. He was pale, waxy, emaciated, and a mass the size of a cocoanut could be felt in the umbilical region, freely movable, not nodular.

At operation there was free fluid in the cavity and a large

mass in the anterior wall of the stomach up to within two or three inches of the esophagus and extending down to the pylorus, involving the omentum, in which the major portion of the growth existed. No metastases were found in the liver but in the anterior parietal peritoneum adjacent to the main tumor. The wound was closed and 10 days later the patient was discharged.

Twelve hours after returning home he had a severe attack of pain without vomiting, but with marked dyspnea, which lasted six hours, followed by death.

No. 19. Male, 50 years of age. Referred by Dr. Smithwick. Mother had died of dyspepsia. Patient had had occasional attacks of indigestion. Eight years ago he began to have gastric pain, relieved by drinking water. This pain came on several hours after eating, the intervals growing shorter in course of time. This pain would persist until he ate more food, when it would be temporarily relieved. He had had no nausea nor vomiting, but was poorly nourished. There was considerable belching.

At operation, at the Carney Hospital, in Sept. 1903, a hard tumor was found in the anterior wall just below the esophagus, of the size of a fist, together with additional nodules nearer the diaphragm.

The pylorus was free and open; no metastases could be felt in the liver. As the growth was too extensive for excision the wound was closed and the patient was discharged in the course of a week.

A month later he reported to the Hospital that he had gained weight, and felt well, still eating every 4 or 5 hours for the relief of pain. Death must have followed before long.

No. 97. Female, 48 years of age, referred by Dr. Dewis and Dr. Pettee. Entered the Carney Hospital in June, 1904.

As long as she could remember she had had indigestion, but within the last year she had lost weight and strength, and the indigestion had grown worse. Distress came on soon after eating, followed by vomiting and relief. For three months she had had almost constant epigastric pain and for two months she had vomited very steadily after eating. No blood in vomitus at any time. Up to two

months ago there had been much gas in the stomach, but recently that had not given trouble. Constipated. Examination of stomach showed considerable sour residue. On attempting to test the capacity great pain was produced and not over a half pint of fluid could be introduced.

Operation showed an excess of serum in the abdominal cavity, and diffuse carcinoma of the pyloric half of the stomach, with metastases in the liver, omentum, mesentery of the small intestine, etc. As it was not possible to make an anastomosis satisfactorily the wound was closed in layers and the patient sent home in a few days, unrelieved.

In the following series of twenty-two cases of malignant disease some attempt was made by operation to relieve the symptoms, at least temporarily. In a few, the operation was clearly inadvisable, to judge from the outcome. But on several of these unfortunate victims operation was done, because the patients had come from a long distance, begging for some slight relief even if the operation should prove fatal. In scarcely any of them have I regretted doing this little to make their death an easier one or to relieve even temporarily the horrible suffering from starvation and the persistent vomiting that these patients undergo.

It is almost impossible that the discomfort from a rapid anastomosis can begin to approach the suffering from starvation and vomiting. On the contrary the relief that so quickly follows, sometimes within twenty-four hours, is one of the most gratifying experiences that the surgeon, as well as the patient, can enjoy. Of course the earlier operations took longer and were much less satisfactory because of the ignorance of technique and the hesitation that comes in working in a new field where medical and lay prejudice is so strongly against surgical interference.

Case 20, one of my earliest attempts at relief, was that of a woman thirty-three years old, who entered the City Hospital in Oct., 1900.

For one year she had been losing weight and strength,

without other symptoms. Seven weeks before entrance she began to have occasional cramps, coming on after eating. Then she began to vomit one to two hours after meals, the vomitus consisting of stagnant food. She had much belching and five weeks before entrance she vomited what looked like coffee grounds, since which time she had remained in bed. She was emaciated and sallow. Just above the umbilicus a hard, nodular, elongated tumor could be felt. Various examinations of the stomach contents were made, but they were of little help except that hydrochloric acid was found absent. At operation a freely movable pyloric tumor was found and a pylorectomy was done with clamps and suture. An attempt was made to tie a Murphy button into the end of the duodenum, but it was unsatisfactory and the side wall of the duodenum was joined to the posterior wall of the stomach with a button, making a satisfactory anastomosis. A long chain of infiltrated tissue, supposed to be lymphatic nodes, along the greater curvature, was removed with the excised portion of the stomach. There is no mention in my notes of nodes in the lesser curvatures, although half of the lesser curvature was removed in the stomach portion.

She did well for a week, when the external wound was found open for about an inch, with the escape of yellowish fluid. Later this fluid became bilious, the patient gradually failed, and seventeen days after operation died.

The technique was undoubtedly at fault here and to that can be ascribed the patient's death. I think, without question, that to-day the same operation could be repeated with almost absolute safety.

No. 21. Male, 61. Entered the City Hospital in Aug., 1901. Seven weeks before entrance, after swallowing by mistake some strong carbolic acid, he began to have stomach trouble, vomiting food about three hours after each meal. He then reduced his diet to barley and milk, retaining this until the evening, when he would vomit all he had eaten during the day. Much loss of weight, no pain, no eructation, and marked constipation. The patient was cachetic; the stomach capacity 960 c.c., hydrochloric acid present, lactic acid absent. Nothing could be felt in the abdomen. For six weeks he had only four stools. He

was treated on the Medical Side for a month before his transfer to the Surgical Side, where a diagnosis of occlusion of the pylorus was made.

At operation there was edema of the peritoneum and considerable serum in the cavity, with thickening about the pylorus, which was nearly closed. A longitudinal incision over the pylorus showed a gummatous-like condition of the walls surrounding the opening, just admitting a director and found with difficulty from within the stomach. The tissues were too thick and the opening too small to warrant a pyloroplasty so an anterior button anastomosis was made. He was in such a condition of starvation that he was fed through the intestinal incision, at the time of operation, with beef-tea, coffee and brandy. Vomiting persisted after operation for two days. He rapidly grew worse, the bowels became loose, he grew delirious, and one week after operation died. Shortly before death he was able to take food by mouth without vomiting, but he was so profoundly starved that he was unable to react.

I think there is no question but what this patient would have been saved had he been operated upon in the early stages of his starvation instead of being held for a month, for the purpose of making an accurate diagnosis and to see if medical treatment could not prove of benefit.

No. 86. Male, 47 years old, with sarcoma of the stomach.

Reported in full by Dr. H. D. Arnold in the Boston City Hospital Reports, Series XI.

This patient entered the Hospital in March, 1898, on account of pain in the epigastrium and increasing weakness. Eight weeks before entrance he had given up work on account of the pain, which was steadily increasing. He had lost weight. There was some eructation, gas and nausea, but no vomiting. The bowels were constipated. A large tumor was felt in the left epigastric and hypochondriac regions. Examination of the stomach contents was contemplated, but the patient grew rapidly weaker and it had to be given up.

At operation, in the left hypochondrium a large nodular tumor was found, the descending colon being collapsed below the tumor, but above it the transverse colon was much distended. It was thought at the operation, as well as be-

fore, that a malignant tumor involved the spleen primarily or secondarily and that the involvement of the bowel was secondary to this. A jejunostomy was made owing to the serious condition of the patient. He improved for a few days, but died a week after operation.

At autopsy the upper colon was found enormously distended. In the stomach, the lesser curvature was found normal except for hemorrhages beneath the mucous membrane, but the remainder of the stomach showed nodular, firm masses beneath the mucous membrane one-half to two cm. in diameter. On the greater curvature near the pylorus was a large excavation with a necrotic mass extending through to the splenic flexure of the colon. The pancreas was evidently involved as its structures could not be made out. "The growth is evidently of mesenchymal origin and should be classed as a mixed cell sarcoma, perhaps better as an endothelioma." (Pathological Report.)

No. 22. Female, 46, entered the City Hospital in Aug., 1901, much emaciated, cachetic, starved and slightly delirious. Two weeks before entrance she had fallen into a trench, striking the region of the stomach, and vomiting soon afterwards. For two years she had vomited directly after meals no matter what food she ate, and she complained of distressed, gnawing sensations, relieved by taking food. The vomitus never was dark colored nor contained blood. On several occasions recently she had vomited large amounts. There was a large mass in the epigastric region extending down to the umbilicus and to the right, somewhat tender and difficult to palpate on account of rigidity.

At operation the pylorus and pyloric third of the stomach were found infiltrated with a hard malignant mass ulcerated at the pylorus. Hard masses were felt in the retroperitoneal space and in the gastrocolic omentum. An anterior anastomosis, with a Murphy button, was made, the patient being in good condition at the close of operation.

The following day she was very weak, the pulse steadily rising, and two days after operation she died.

Partial autopsy showed a tight joint without evidence of a peritonitis.

No. 23. Male, 53 years old. Entered the Medical service of the City Hospital in Nov., 1901.

A year before he had distress and epigastric pain about an hour after eating, lasting for several hours, disappearing when the stomach was empty, relieved by hot drinks and hot applications. There was eructation but no vomiting. He had lost weight steadily, but had kept at work up to July, when he grew very weak. Two months before entrance he began to vomit once or twice a week very large amounts, often with dark coffee grounds, and for a week before he was operated on he vomited several times a day. Marked constipation. He was emaciated, pale, and in the epigastrium was a large mass tender on pressure.

At operation a large nodular mass of the size of two fists was found in the pyloric half of the stomach and deep glands could be felt all through the upper abdomen. The cardiac half of the stomach was not involved and an anterior button anastomosis was made, the patient standing the operation well.

After the operation he improved, had no vomiting for two weeks. Then the vomiting returned, he gradually lost strength, and died five weeks after operation.

The abdomen was opened through the incision and the button was found in the stomach.

No. 24, Male, 30.

Two weeks and a half before entrance to the Medical Side of the City Hospital, in Oct., 1902, the patient had had a sudden onset of pain in the epigastric region which had continued up to his entrance. He had vomited persistently without regard to food and was in a condition of acute starvation. He had had similar attacks one, ten and fifteen years ago respectively, lasting about a week.

He was transferred to the Surgical Side and at operation a malignant tumor at the pylorus, firmly adherent to the gall bladder, the ducts and deep tissues, was found. The pylorus could not be freed sufficiently for its removal. The stomach was dilated and the lumen of the pylorus practically closed. An anterior button anastomosis was done and the abdomen closed rapidly. The patient stood the operation fairly well, but failed gradually and died three days afterwards of exhaustion.

No. 25. Male, 33 years old, entered the City Hospital in Dec., 1901.

Nine months previously he had attacks of colic without nausea or vomiting. Two weeks later there was dull pain in the epigastrium constantly, most marked two or three hours after eating, with nausea, eructations but no vomiting till the latter part of November, when he vomited a quart of brownish blood. Since then he had only vomited once. He had lost weight and strength and had been able to do no work for two months on account of weakness. Just below and to the left of the umbilicus was a tender mass the size of a small orange.

At operation a hard malignant tumor in the pyloric third of the stomach was found starting from or close to the pylorus. The omentum was adherent by direct malignant infiltration. There were enlarged glands in the gastrohepatic omentum, and behind the peritoneum, while through the omentum itself were a few small nodules. An anterior button anastomosis was made and the wound closed. . He vomited a few times after operation, but was relieved by lavage. A month afterward he was discharged. About a year later the patient reported that he was hard at work and in good condition.

No. 26. Female, 30 years old, entered the City Hospital, Jan. 1903.

For about three months she had had pain in the epigastrium, vomiting almost everything except milk and lime water. Pain was worse at night, so that she was not able to sleep. The stomach contents showed free hydrochloric acid and the absence of lactic acid. She improved somewhat under rectal alimentation, but when given food by mouth vomited excessive amounts. There was a movable epigastric tumor. No cachexia.

At operation, an excessive quantity of straw-colored serum was found in the abominal cavity ; a large malignant tumor of the pylorus was found infiltrating along the lesser curvature to the esophagus, along the greater curvature to the omentum, and into the great and small intestine in the neighborhood. The stomach wall was thickened and odematous. An anterior button anastomosis was made and the wound closed. She steadily improved after operation and was soon eating solids without nausea or vomiting. Discharged at the end of two weeks to the Convalescent Home.

A month later, however, she returned to the Hospital, cachetic, greatly emaciated—but without having vomited—with edema and ascites; and she rapidly failed and died in the middle of April.

No. 27. Male, 54. Admitted to the City Hospital, April, 1903.

A history of stomach trouble for six months, with a loss of fifty pounds in weight, beginning with occasional vomiting, increasing in frequency to two or three times daily, always after eating, coming on as a rule within fifteen minutes. No hematemesis, no pain. He was emaciated, and in the left epigastrium there was a distinct prominence. Examination of the stomach showed absence of hydrochloric acid and presence of lactic acid and a dilated stomach. A week after his entrance he was transferred to the Surgical Side for operation, when the stomach was found with thick, hypertrophied walls, not dilated, rigid and unyielding. The pylorus was thickened but not indurated as from malignant infiltration. It was impervious, so far as could be told by examination through the stomach walls. No nodules were felt. An anterior button gastroenterostomy was made and the wound closed. After operation vomiting ceased, but the patient steadily grew weaker and died without other symptoms, four days later.

No autopsy was obtained, and the diagnosis cannot be absolutely established, but in all probability it was diffuse carcinoma of the stomach.

No. 28. Male, 49 years old. Referred to me by Dr. J. A. Gordon.

For five years he had been under treatment by a prominent physician for dyspepsia, fermentation and vomiting. He had improved somewhat up to about nine months before I saw him. Then there was recurrence of his trouble with enormous dilatation and fermentation. There was no history of hemorrhage, but the vomitus contained food eaten one or more days previously. There was marked loss of weight, and examination showed a distended stomach, with the lower border half way between the umbilicus and the pubes.

At operation at the Boothby Hospital the pyloric third of the stomach was found to be a mass of malignant infil-

tration extending into the omentum. An anterior button anastomosis was made and the wound closed. He was soon up, eating heartily of soft solids and liquids, and returned home in good condition.

Later he was going to business regularly, but gradually the symptoms returned, he lost weight, and died several months after operation.

No. 29. Female, 62 years old. Referred to me by Dr. F. J. Peirce.

Twelve years before, after a fall, she was confined to her bed for five or six weeks, and had been an invalid ever since. She complained at the time of injury of much abdominal pain and distention, but had no vomiting. Six months before I saw her, her first attack of vomiting came, and this was followed by nausea, lasting for some months. Then vomiting returned, and steadily increased in frequency. No blood nor coffee grounds had been seen. The vomitus consisted of retained food, and at times was excessive in quantity. She had lost thirty pounds in the last eight months. No history of stomach trouble in youth could be obtained. Examination showed an emaciated woman with an irregular tumor in the epigastrium. Irrigation of the stomach showed decomposed food.

At operation, at the Boothby Hospital in Feb., 1903, a hard malignant tumor in the right portion of the stomach, along the greater curvature and close to the pylorus, but not involving it, was found. It invaded the mesocolon and the omentum. An anterior button gastroenterostomy was done. A very much distended gall bladder was found, with two large stones, wedged in the cystic duct, which were removed. Patient slowly gained and was able to take sufficient food to satisfy her hunger, and returned home in good condition, but some weeks afterwards gradually failed and died.

No. 30. Male, 44 years old. Entered the Carney Hospital June, 1903, for sarcoma of the testis, which was removed. In the upper right abdomen was a large nodular tumor, which prevented the patient from lying down with comfort and obstructed the pyloric outlet. He had more or less regurgitation, without nausea. Soon after eating, he complained of more or less burning sensation in

the stomach. There was another metastatic growth in the right neck. Operation was advised for temporary relief.

At operation a large nodular adherent mass in and about the pyloric third of the stomach, with retroperitoneal and mesenteric nodes, was found. Universally throughout the omentum were small translucent nodules one-eighth of an inch in diameter. An anterior button gastroenterostomy was done and the wound closed. The patient recovered well from the operation, and was sent home in a few days perfectly comfortable.

The later history is unknown, but he undoubtedly succumbed to his disease within a short time.

No. 31. Male, 27 years old. Was transferred from the medical service of the Carney Hospital, June, 1903.

The patient was in constant pain, with vomiting and marked emaciation. An operation was advised as a palliative measure only.

In the esophageal third of the stomach was found a hard nodular growth extending up to the diaphragm, but without evidence of metastases. It apparently blocked the entrance to the stomach so the jejunum was opened, a catheter tied in, and liquid food given at once. He was fed through the tube for several days, at the end of which time the opening into the stomach apparently enlarged, and he was able to take semi-solid food. He continued taking food by mouth, but rapidly grew weaker, and was transferred to the Ward for Incurables, where he died shortly after.

No. 32. Female, 35 years old. Referred by Dr. Foley, of Worcester. Entered the Carney Hospital in Sept., 1903.

In February of the same year she began to have gastric symptoms, relieved by vomiting, but the symptoms steadily grew worse, the vomiting became sour, she lost weight, and finally was reduced to a diet of liquid peptonoids, on which she had lived for the six weeks before I saw her. She was much emaciated, could not sleep at night, and had pain in her left side. She had never vomited fresh blood, but examination showed some undigested blood. The pain usually came on from a few minutes to an hour after eating, and was relieved at once by vomiting, if the vomitus was in considerable amount. She had vomited retained food.

A short time before I saw her she had been in a hospital, and had derived considerable relief, going for a week or more without vomiting. After this treatment she had been on light mouth feeding for a while, but, as noted above, for the last six weeks had confined her diet to liquid peptonoids. Recently there was temporary edema of the lower extremities. The patient was emaciated, the abdomen showed visible peristalsis, and in the epigastrium above the umbilicus was a tender movable tumor, about an inch in diameter. The stomach was moderately dilated.

At operation a typical malignant growth involving the lesser curvature to the pylorus, was found, with recent malignant adhesions of the neighboring anterior tissues. An anterior gastroenterostomy, with a Murphy button, was made and the wound closed. The patient gained steadily after operation, and was discharged in three weeks eating ordinary food.

Five months after operation a letter from Dr. Foley reported that the patient had gained forty pounds, had been able to go about, and was in very comfortable condition, but that recently she had begun to show signs of invasion of the opening with return of vomiting.

No. 33. Male, 44, referred by Dr. Webber, of Calais, Me. Entered the Carney Hospital in Sept., 1903.

Since June he had had stomach trouble, beginning with loss of appetite, pyrosis and belching. In July he vomited for the first time, afterwards vomiting from one to three times daily. At times the vomitus was dark colored, but never with fresh blood. Food had distressed him for several months, especially when lying down; pain was absent when the stomach was empty. The lower border of the stomach was at the level of umbilicus. No tumor could be felt on palpation.

At operation, in the lesser curvature and close to the pylorus, probably involving it secondarily, was a hard nodule the size of an English walnut. In the omentum and mesentery were numerous hard lymph nodes, one of which was removed for diagnosis. A posterior gastroenterostomy, with clamps, and suture, was made and the wound closed.

The patient was soon eating the regular food and returned home at the end of two weeks.

In May of this year the patient reported that he had had no vomiting since the operation, had eaten three square meals daily, and had not lost a day's work; but he was beginning to lose strength and was undoubtedly gradually failing from general malignant infection.

No. 34. Male, 38 years old, entered the Carney Hospital in Nov., 1903, and was transferred from the Medical Side for operation. He had complained of stomach trouble for eight weeks, vomiting occasionally one half hour after meals, but for the last four weeks he had vomited everything. There was much gas, epigastric pain and constipation. Examination of the fasting stomach showed eight and a half oz. residue. Free hydrochloric acid absent, lactic acid present.

At operation, by Dr. Bottomley, a hard mass half the size of the fist was found involving the pylorus. The retroperitoneal glands were enlarged; the stomach not much distended. A posterior anastomosis with clamps and suture was made, some difficulty being found in obtaining sufficient healthy tissue to work with.

The patient was in poor condition and gradually died about two weeks after operation.

No. 35. Female, 49 years old, referred by Dr. Glennon, of Stoughton, entered the Carney Hospital in Jan., 1904.

For a year she had had indigestion and pain, referred to the stomach, with distress following food. During the summer she was worse and had occasional vomiting. She was very much troubled with gas and constipation. Lavage showed undigested food, hydrochloric acid present and lactic acid absent.

At operation, by Dr. Bottomley, a hard, malignant tumor of the pylorus, with involvement of the glands posteriorly, was found. A posterior gastroenterostomy, with clamps and suture, was made and the wound closed.

The patient vomited only two or three days after operation, some coffee ground substance being in the vomitus. She then began to fail gradually, without nausea or vomiting. Then suppression of the urine appeared several days afterwards, followed by death.

No. 36. Male, 40 years old, referred by Dr. Hunting, of Quincy, entered the Carney Hospital in March, 1904.

A year ago he began to lose weight and complained of dyspepsia at the same time. At first there were eructations of mucus, but during the summer he vomited sour food, usually four or five hours after eating. No blood had been seen at any time. The vomiting came on about every day and constipation was marked. For the last two months he had practically vomited all that he had eaten, but no history of excessive quantity could be obtained. He was constantly hungry, and eating satisfied the hunger in spite of the vomiting. He had lost weight and was markedly emaciated. He had been in one of our large hospitals under medical treatment, recently, growing rapidly weaker. In the epigastrium and left hypochondrium was a nodular superficial tumor, moving with respiration. He was able to digest a little malted milk since he had been on rectal feeding. An operation was advised in the hope that it would at least enable him to take food by mouth until he died of general malignancy.

At operation, a hard nodular mass involving the pylorus and pyloric third of the stomach in both walls, was found, infiltrating the liver. It was difficult to obtain enough healthy tissue to make an anastomosis, but an anterior button anastomosis was made and the wound closed. The patient recovered well from the operation, was able to take food comfortably, and was encouraged with the result; but he gradually grew weaker and died nine days after the operation, without having vomited.

No. 37. Male, 65. Referred by Dr. Deacon, of Milltown, N. B. Father died of stomach trouble at 67 years of age.

For a year the patient had complained of slight soreness in the right epigastrium, but without dyspeptic symptoms. Three months ago there was much gas and he was obliged to sit up in bed at night to relieve the distention. There was slight indigestion at this time, with distress after eating, but no vomiting. His appetite was good. Six weeks ago there was griping pain in the epigastrium and he was unable to sleep. He still had no vomiting, but began to limit his diet to liquids and soft solids. Four weeks ago he vomited after eating, and there was much pain and annoyance from persistent belching, which came on in spells.

For two weeks he had been nauseated all the time, vomiting constantly. No blood had been seen until two days before entrance and then only in a few streaks. He had lost thirty lbs. in six weeks and had been confined to bed for the last week. He entered the Carney Hospital in April, 1904, emaciated, with a hard nodular mass the size of a fist, in the epigastrium, not very tender. The patient was too sick to justify operation, but he had come such a long distance with a forlorn hope of even temporary relief that I could not refuse at least exploring the abdomen.

At operation the pyloric third of the stomach was filled with nodular masses aggregating a tumor the size of two fists. The growth invaded the adjacent liver and in the latter were metastatic masses the size of walnuts. Along the greater curvatures were large malignant nodes, and in the retroperitoneal space were similar smaller nodes. The left portion of the stomach was pale and brittle. There was free fluid in the general cavity, and only by strong tension on the stomach could an area free of growth be brought into the field. To this an anterior button anastomosis was made. Exploration of the inside of the stomach showed nodular growths blocking up the pyloric end. There was no immediate shock from operation. The following day the patient had made a good recovery, but was still weak and there was considerable fresh blood in his vomitus. Two days later there was still some blood, dark in color but much less in quantity. The patient grew weaker, however, rejected his enemata, and three days after operation he rapidly failed and died.

No. 90. Male, 56 years old. Referred by Dr. Benner, of South Framingham.

Stomach trouble began about fifteen years ago, with distress after eating, but vomiting did not appear until three months ago. He had never vomited blood, but had lost much weight. Examination of the stomach showed a capacity of over two quarts, with retained food, the lower border being below the umbilicus. For years the patient had been under the care of various physicians for dyspepsia, with only temporary relief. A day or two before I saw him he had lost rapidly and was stupid and partially delirious at examination. Operation was requested at any risk

and was done at once at the South Framingham Hospital. The stomach was found dilated and distended with gas. In the pyloric region was a hard, scirrhus growth apparently a carcinoma of the pyloric ring itself. In the neighborhood were numerous small, white metastases extending into the lesser omentum, the greater omentum, the mesocolon and the mesentery, with scattered nodules in the jejunum. The liver was normal. A posterior gastroenterostomy, with clamps and stutures, was done as rapidly as possible, and the abdomen closed in layers. In both the stomach and jejunum was found very foul, decomposed blood, some of which the patient vomited, although the stomach had been carefully washed out previously. There was severe shock and the patient died in twelve hours.

No. 91. Male, 62 years old. Referred by Dr. George H. McIntire, of Cambridge.

For several years he had had stomach trouble, beginning with dyspepsia, coming on after meals. He had been a commercial traveler for a number of years, with irregular meals, and recalled a number of times when he had attacks of temporary distress, without vomiting. Then the dyspepsia became more persistent, and for the past year it had steadily increased, with vomiting at times. For two years he had not been able to sleep through the night without rising once or twice and taking a dose of sodium bicarbonate to relieve the gaseous distention of the stomach. Vomiting began about a year ago, and consisted of poorly digested food, and at times of food that had been retained for over twenty-four hours. He had never noticed blood nor coffee grounds, but had vomited excessive amounts, and in the last few months had lost weight. The distress after meals would come on in about one hour, and he was made worse by lying down. He had limited his diet more and more, and when seen was eating very simple food. He had been treated by various physicians—stomach specialists among them; forced feeding had been tried, but attacks of severe vomiting was the main result.

At operation, at the Carney Hospital, a nodular, irregular tumor was found at the pylorus, with extension along the posterior wall of the duodenum for about 3 inches, making it impracticable to clamp the bowel through healthy tissue

in order to perform a pylorectomy. No enlarged glands were found in either of the omenta. A posterior gastroenterostomy, with clamps and sutures, was done, with a short jejunal loop. In the stomach was some digested blood. Wound closed in layers. Patient in good condition at close. Convalescence was satisfactory and several weeks later he was in excellent condition.

No. 96. Male, 62 years old, referred by Dr. Boland.

For three years the patient had had pain in the stomach and for two years he had been unable to work. The pain would come two or three hours after eating and during the night it was so severe that he could not sleep. He had had some vomiting, of excessive amounts and of retained food, but without blood or coffee grounds. There was much eructation of gas with relief. Marked constipation for two years. He had lost about thirty lbs. in two years and had been under treatment at the various hospitals, etc., without relief.

At operation, at the Carney Hospital in June, 1904, a dilated sagging stomach was found with a hard scirrhus growth at the pylorus adherent to the gall bladder near the cystic duct and to the liver which was directly infiltrated. The patient was in no condition for radical operation, so a posterior gastroenterostomy with clamps and sutures was made and the abdomen closed. There were no enlarged lymph nodes to be felt, but there was malignant infiltration into the liver. Convalescence was most satisfactory and he was discharged shortly afterwards eating and digesting well.

Of the foregoing thirty-two patients operated upon for malignant disease hardly a single case came early enough for radical cure. For the early deaths after operation less blame must be attached to the interference than to the long delay before operation was allowed. A few cases were of the fulminating type, and early operation, if it had been obtained, would have been futile.

In many of the histories of the malignant cases in the hospital records the early symptoms were not put down and probably were not inquired into. In all probability careful

cross-examinations would have brought out suggestive and pertinent data by which malignancy could have been suspected.

Practically no case, however hopeless, was refused operation, and the few that were so markedly benefited give encouragement in dealing with these forlorn people.

In several, the degeneration of a benign ulcer was most probable and it emphasizes the occasional danger in treating a chronic ulcer as though it would remain benign indefinitely.

The rarity of vomiting as a symtom should be referred to over and over again, as demonstrated in these cases.

The combination of advanced age and steady loss of weight is very suggestive. Persistent pain in the stomach was common. In a few instances it was relieved temporarily by the ingestion of food.

Just as in chronic ulcer the steady limitation in diet is one of the most valuable clinical symptoms, especially if it takes place in spite of rational internal treatment.

Some patients were watched by their physicians until a tumor could be felt, in order to make a diagnosis, in the face of more leading signs as shown in emaciation, pain, vomiting or nausea, retention of food, etc.

However willing we may be to attribute death in the worst cases to the operation, yet to one who has watched them closely it is clear more and more that the prolonged starvation, and the absorption of decomposed and never digested food play the most important role, although the end occasionally may be hastened a few days by operation.

The following seven cases of perforation are grouped together:

No. 38. Female, 21 years old.

For three or four years she had complained more or less of constant pain and distress in the stomach. She had never had hematemesis and, in fact, said that she had never vomited till four days before entrance to the City Hospital, Oct., 1896. Pain in the stomach became more severe than usual

at that time, but she continued at her work. This pain persisted and the day before entrance, in the morning, suddenly became very severe. She vomited and had a chill. On going to bed the abdomen at once began to distend. The vomiting ceased shortly afterwards, but the epigastric pain and distention continued. At entrance she looked blanched, with a pinched, anxious face, a distended, tender abdomen, with the tenderness and rigidity most marked in the left side below the costal border. There was rapid, shallow respiration and quick pulse.

At operation the peritoneal cavity was found to contain gas and stomach contents. A round, punched-out perforation was found a little anterior to the lesser curvature, at the pyloric end of the stomach, barely admitting the tip of the finger. The surrounding wall of the stomach was too brittle to allow the ulcer to be closed by suture, so the pyloric end was drawn forward to the surface of the parietal wound and sutured there into place. The general cavity was then flushed out with sterile water and drained with iodoform wicks and a glass tube. A rubber tube was sutured into the stomach through the ulcer and carried to the outside of the dressings. Although the patient was in bad condition at the beginning of operation, she stood it fairly well, stimulation being given freely. She improved for four days and was apparently on the road to recovery, when in the evening she suddenly collapsed and died with much suffering.

Autopsy showed a large pocket of pus deep in the pelvis. The ulcer was well walled off from the general cavity. Had the pelvis been drained, as has been emphasized by Lund, I think recovery would have taken place almost without question.

No. 39. Female, 21 years old. Entered the City Hospital in Oct., 1897.

She had complained of dyspepsia for several years, at times vomiting, but without blood until five weeks ago, when she vomited material that looked like coffee grounds. Two weeks before entrance there was severe pain in the left side of the abdomen, lasting for twenty-four hours, which on the following day was very severe, but did not last long. This pain she described as of a gnawing charac-

ter. For a long time she had complained of soreness over the gastric region. Four days before entrance the pain in the left side was more severe, coming on suddenly with vomiting but without blood. Since then the pain had been continuous while the tenderness of the abdomen had been general from the start. The bowels, naturally constipated, had moved frequently. At entrance the abdomen was distended and exquisitely tender. She was transferred from the medical service on the day of entrance, for operation, when edema of the abdominal wall was found, especially marked above the umbilicus. The peritoneal cavity contained gas, pus and stomach contents. An opening into the stomach was found on the anterior wall near the lesser curvature, about the size of a lead pencil, with thickened, cheesy edges. This could be turned in and sutured. The general cavity was then flushed out and the region in the neighborhood of the ulcer was packed with glass tube and iodoform gauze. The abdomen was filled with salt solution, the foot of the bed was elevated, and stimulation used freely.

The following day she was much weaker, and two days after operation she died. No autopsy was obtained, but examination through the wound showed that there had not been any leakage, the wicks being clean and dry.

No. 40. Female, 21 years old. Entered the City Hospital in Dec., 1900.

For six months or more she had had stomach trouble, with pain coming on immediately after eating, and relieved by vomiting. She had never vomited any blood nor passed any dark colored stools.

Two days before entrance she was taken with sharp pain in the upper abdomen three hours after eating, followed by vomiting, but without blood. During the evening the pain became severe and was followed by a chill. At entrance she felt better but was vomiting. She looked sick, with drawn face, moderate distention, tenderness and spasm all over the abdomen, most marked in the epigastrium.

Operation at once showed cloudy serum beneath the peritoneum and diffuse marked fat necrosis of the omentum. There was thin pus in the pelvis and epigastrium. The omentum was found surrounding a large pocket of bile and

thin pus, either behind the omentum or in the lesser peritoneal cavity. In addition there was another large pocket of bile, pancreatic fluid and pus in the hepatic region. There was fibrin, with necrotic areas in the pyloric end of the stomach, and on the anterior surface, close to the upper border, was a clear, punched-out opening a quarter of an inch in diameter, which was easily closed with a double layer of mattress sutures. The cavity was irrigated thoroughly, both the epigastrium and pelvis being drained. Just as soon as the operation was started the patient went into collapse and although operation was done as rapidly as possible she was in profound shock at the close. She rallied a little, but died in about 12 hours.

Partial autopsy showed the location of the ulcer as described above. In this case there was a pancreatitis in addition to the perforated ulcer.

No. 41. Female, 25 years old, entered the Carney Hospital medical service in Nov., 1903. She had complained of indigestion all summer, with sharp pain in the epigastrium in the morning and soon after eating. There was some gas and at times she vomited several times a day, followed by freedom from vomiting for a week. The amount had always been small and nausea preceded the vomiting. Nine days before entrance she complained of a sharp epigastric pain, radiating to the right side and left flank, back and shoulders. It was so severe that she fainted. The pain continued until the following night, when she was given castor oil, and vomited. She then went to bed for five days, at the end of which time the vomiting and pain returned. The day before entrance she vomited and was tender along the lower costal border. The abdomen was tense but not distended. There was marked tenderness in the left side, from the ribs to the groin, as well as in the epigastrium. She was transferred three days later to the surgical side, with severe pain, high leukocyte count, and marked restlessness.

At operation there was a large quantity of foul pus and gas in the abdominal cavity. The anterior wall of the stomach formed the floor of the abcess cavity, the pus burrowing over the dome of the liver laterally, on both sides, as well as beneath it. Below and laterally the dilated

stomach was adherent to the anterior wall, evidently limiting the spread of the pus. No definite perforation was seen. The stomach was adherent to the liver and these adhesions were not disturbed except to open whatever pockets there were. A small opening was made over the pubes, but the lower portion of the abdominal cavity was found free of infection and this wound was closed at once. The upper wound was packed with iodoform gauze and a glass drain, the patient being no worse at the end of the operation than at the beginning.

The purulent discharge continued for a number of days, while she slowly and steadily improved. At the end of six weeks she was discharged, much relieved, to our Surgical Out-Patient Department, where she was treated for several weeks for a granulating wound in the upper part of the abdomen. In March, four months after operation, she was at work and in good condition. When seen in May she was still in good condition and working steadily.

No. 42. Male, 45, was seen with Dr. Brown, of Newburyport in Oct., 1903.

When twenty years of age he had attacks of abdominal pain somewhat similar to the present one, coming on every few months, but not so severe. He would be sore for a day or two, but gradually outgrew these attacks. For several years he had indigestion, which disappeared entirely at times. Pain had always been in the epigastrium, coming on about an hour after eating. He had never vomited. For a few days before I saw him he had felt as though there was a lump in his epigastrium. The night before operation he was awakened with very severe epigastric pain. Dr. Brown saw him an hour later and found him in agony with a hard, rigid belly. He had vomited somewhat, but without blood. He was given morphia in a large dose and taken at once to the Newburyport Hospital.

At examination, six hours later, he had abdominal spasm, most marked in the epigastrium and right hypochondrium.

Operation showed free gas, bile and mucus in the abdominal cavity and a small round opening in the anterior wall of the duodenum close to the pylorus, from which gas and fluid were escaping copiously. About the opening there was slight thickening and a faint scar that would

have escaped notice but for the hole. The latter was closed with a double purse string suture and the omentum sutured over this. A posterior gastroenterostomy, with clamps and suture, was made and the cavity irrigated out thoroughly. The upper wound was closed, but a small suprapubic puncture was made for the draining of the pelvis, and we found that, in spite of the thorough irrigation, there was some fibrin deep in the pelvis, which would have escaped detection otherwise.

The patient made an uninterrupted recovery and six months later was perfectly well.

No. 43, Female, 19 years old, entered the City Hospital in Jan., 1900.

Two years before that she had been treated on the Medical Side for gastric ulcer, vomiting considerable blood at the time. Three months before I saw her she had vomited for several days and had had much abdominal pain. At the end of a week she was well again. Two weeks ago she had a recurrent attack and vomited everything that she ate. She also had considerable pain in the epigastrium, extending to the left shoulder. Since her early attack, in 1898, she had never vomited any blood, but had been troubled with heart-burn, gas, distress, and, at times, pain after eating. In other words she had never been entirely relieved of her ulcer symptoms. The afternoon before entrance she had acute pain in the epigastrium, without vomiting or fainting. She was restless and feverish all night but in the morning felt better. At entrance she was in good condition, with no distention, but with spasm and tenderness of the left rectus and in the epigastrium.

At operation the peritoneum was found very edematous. Lying close to the anterior wall was a cyst the size of a hen's egg, containing serum, apparently due to peritoneal fluid pent up in the adhesions. A few flakes of lymph were found on the neighboring coils of intestine. At the pyloric end of the stomach close to the lesser curvature was a perforation a quarter of an inch in diameter, through which some curds could be pressed. This ulcer lay in the midst of thick edematous tissue, extending towards the pylorus and half way to the edge of the greater curvature. Any stitches placed in this perforation cut out at once. A

crater-like area was then excised and the wound was closed fairly satisfactorily, but the stomach wall was so brittle that it was difficult to invert the edges in order to cover in this line of sutures, so the healthy, lower portion of the stomach below the perforation was turned up and sutured against the line of stitches, completely shutting off the perforation from the general cavity. The abdomen was then irrigated out and the wound closed except for an iodoform gauze and glass drain.

She vomited a few times for several days, but otherwise convalesced satisfactorily and was discharged in about six weeks, with the wound firmly healed and without symptoms.

Nearly four years later she returned to the Carney Hospital with a recurrence of her old symptoms, that is, distress and pain about an hour after eating, vomiting of blood, with temporary relief following evacuation of the stomach. These had returned about three weeks before her entrance and, fearing that she might have another perforation, she sought operation.

At operation, in Dec., 1903, the omentum and the anterior wall of the stomach were found adherent to the parietes and the stomach appeared considerably dilated. Both lobes of the liver were adherent to the anterior stomach wall by old, firm adhesions and deeper by lighter adhesions, the liver being drawn down for an inch or more below its normal level. Over the duodenum and pyloric portion of the stomach there was a light sheet of peritoneal-like adhesions, obscuring this portion of the stomach. The gall bladder was normal. The portion of the stomach adherent to the parietes was approximately in the region of the former perforation. The adhesions here were firm and deep and after being dissected away left a raw space that was covered over by a peritoneal flap. A posterior gastroenterostomy, with clamps and sutures, was made and the wound closed in layers.

The patient vomited more or less for the first three or four days—some of the vomitus containing digested blood—and she was discharged in three weeks, relieved of her symptoms and feeling well, eating house diet without discomfort and a good appetite. When seen recently she was in excellent condition, eating ordinary food and working steadily.

No. 98. Female, 21 years old. Was seen by Dr. Bottomley, with Dr. Thompson, of Fitchburg.

The patient had been strong and well up to four years ago, when she had an attack of grippe, with loss of strength, followed in a year by distress after eating, not marked at first, but a year later accompanied by attacks of vomiting lasting from a day to a week. No blood had been seen in the vomitus nor stools.

For four or five months she had had epigastric pain, more or less constant, and always after eating.

Forty hours before she was seen by Dr. Bottomley she had a sharp sudden attack of pain, coming on two hours after eating, with collapse, nausea and extension of the pain over the abdomen generally, and into the left scapular region. These symptoms continued for thirty-two hours before she summoned medical aid. Distention began about twelve hours after the onset of the attack.

At operation there was general abdominal distention, a pulse of 130, temperature 100° and respiration 40, though she did not look very ill. Tenderness was most marked in the epigastrium and to the left. There was general abdominal spasm. On opening the abdomen, gas and large quantities of light green fluid escaped. A perforation, admitting the finger, was found on the anterior wall near the pylorus and fairly close to the greater curvature. About the perforation there was considerable induration, but it could be turned in and closed by a double row of linen purse-string sutures. The peritoneal cavity was washed out, the pelvis drained through a suprapubic opening, and the patient put to bed with head elevated.

She recovered well from the operation, but died in forty-eight hours, of general peritonitis.

Although perforation of an ulcer is rare, the possibility of this accident should be considered as carefully as the possibility of a perforation of an appendix, especially when a previous history pointing to gastric trouble can be obtained. Probably a large proportion of these cases can be cured if they are detected and treated surgically within the first twenty-four hours.

One of my cases would probably have recovered if I had

had the wisdom to drain the pelvis, which in such cases cannot be flushed out thoroughly from the upper wound.

All of these cases gave histories of more or less continuous gastric symptoms before the operation. The plea that some cases of perforation recover spontaneously as shown in several of our patients reported in the ulcer series is not worthy of consideration, when contrasted with the relative safety of intelligent early surgical interference.

The following case is the only one of pyloroplasty that I have done. It is an operation that nowadays is discouraged as being less efficacious than the more radical procedures.

No. 44. Male, 39 years old, entered the medical service of the City Hospital in Oct., 1899.

Two years before that he began to have epigastric pain after eating, with much vomiting. He was in a hospital in Brooklyn for three or four months, where he improved somewhat. He then grew worse and was in a hospital in Maine for several months, steadily growing worse. At entrance he had pain in the epigastric region, and vomited everything he ate, the vomitus being dark generally, but slightly tinged with blood once or twice. He had lost weight steadily, was very weak, and had much belching of wind. The bowels were constipated. Numerous tests were made of his stomach contents, hydrochloric acid being found present or absent at different times, and so far as the interpretation of the chemical analysis went nothing definite could be determined as to the presence or absence of a malignant growth. In brief, there was marked stasis and distention, persistent vomiting, with pain in the epigastrium; in addition to this he was steadily losing weight. After about seven weeks of medical treatment he was transferred to the surgical service, much emaciated, with tense abdomen, but without any definite tumor to be felt.

At operation the pylorus was found closed so that it admitted only a director. A pyloroplasty was done and the abdomen closed. No ulcers were found in the stomach or in the pyloric region. He rapidly gained weight and strength and was discharged in a month, eating solid food, with good digestion. A year later, he was seen in perfect health, fat and strong.

This, the only case operated upon by the old method for enlarging the pylorus, illustrates the wisdom of operating in cases no matter how hopeless the outlook may be. For all that we could tell, the case was malignant, and had it been so, he probably would have promptly died. As it was, he proved to be the most brilliant and satisfactory case that one could desire.

Cases of partial gastrectomy:

No. 45. Male, 35 years old, was seen in Nov., 1901, with Dr. Goodwin, of Clinton, convalescing from an attack of acute gastric ulcer and suffering in addition from a mild attack of appendicitis. He quieted down and operation was advised in case of return of the trouble. He gained for a number of months, then a short time before operation he had a return of his gastric pain and eructations of sour fluid. This was followed by distress, with vomiting, the distress severe in character being located in the epigastric region. Vomiting relieved it temporarily. Three times he had noticed coffee-ground material.

At operation, Nov., 1902, at the Clinton Hospital, a dilated stomach was found, with a hard, crater-like tumor of the lesser curvature, a little to the right of the middle. There was also an old scar and induration of the pylorus. A partial gastrectomy was done, the proximal third only been left. A button anastomosis was made between the stomach at its lower anterior edge and the jejunum. The omentum was sutured about the joint. The patient was in good condition throughout.

He steadily improved and in March, 1904, he reported himself as in good health, eating heartily.

Pathological report of the ulcers, which at the time of operation looked suspiciously like carcinoma, showed them to be simple ulcers of the stomach.

No. 46. Female, 31 years old, referred by Dr. Smithwick.

Eleven years before I saw her she had indigestion, with vomiting, lasting about six weeks. At no time was blood seen. After this more or less stomach trouble persisted, marked by pain in the epigastrium, and indigestion. In 1898 there was a severe attack of pain and vomiting, with

some blood, and she went into the hospital for a month and was convalescing for two months. She then worked four months and had another attack, which laid her up for three months, but after that was unable to work for two years. Before I saw her, in Aug., 1903, she had tried to work for four months, but every day she had epigastric pain with vomiting, and was unable to eat anything except milk and lime water, or malted milk. Vomiting came on within an hour after eating and she said that she had vomited food eaten twenty-four hours previously. She was losing weight and examination showed local tenderness under the left rectus, which was rigid.

At operation at the Boothby Hospital, in Jan., 1903, an indurated, puckering tumor in the anterior wall of the stomach, probably involving the lesser curvature, and extending downwards half way to the lower border — almost making an hour glass contraction—was found. Three bands of adhesions passed from the stomach near the pylorus to the upper and under surface of the liver. There was a scar at the pylorus, looking like the scar of an old ulcer. The tumor was evidently an ulcer with marked contraction of the adjacent stomach wall. The ulcer was excised, leaving a large opening in the anterior wall. The edges were sutured with catgut to control bleeding and then the peritoneal edges were closed, in a sagittal line, with a right angle continuous linen suture, reinforced by mattress suture. After closure of the stomach there was ample room for passage of food. The abdominal wound was closed in layers with a temporary wick drain down to the stomach suture line, the patient being in good condition at the termination of the operation.

For three days she did well, when suddenly she complained of pain in the abdomen, the pulse rose rapidly to 160, and she died within twenty-four hours.

Partial examination through the wound showed that there was probably a leakage through the stomach wound into the abdominal cavity. Examination of the ulcer showed it to be a simple ulcer and not malignant. This patient died directly as the result of operation. Had a double line of sutures been placed instead of a single line reinforced, as it was, by occasional mattress sutures, the result undoubtedly would have been different.

No. 47. Female, 36 years old, referred by Dr. Goodwin, of Clinton.

For nine years the patient had had indigestion, with gradual development of vomiting, the attacks varying in length, at times being free for a few days. Two months ago she grew worse, vomiting a little while after meals, the vomiting being preceded by severe pain in the epigastrium. There was no history of retained food and for two weeks she had eaten scarcely anything.

The stomach was found dilated, without evidence of tumor but with epigastric tenderness.

At operation, at the Carney Hospital, Dec., 1903, on the anterior wall at the lesser curvature, infiltrating the lesser omentum, was a hard, crater-like ulcer of the size of a silver dollar. No metastases could be felt anywhere. A large section of the upper border of the stomach was removed and the stomach walls closed in with linen sutures. A posterior gastroenterostomy was then done and the abdominal wound closed in layers, allowing for a temporary cigarette drain at the upper angle. After the operation the patient had no vomiting, was rapidly put on house diet, and in three weeks was discharged, eating and enjoying regular meals.

Pathological report of the ulcer showed it to be chronic inflammatory.

The patient has recently been heard from and is in excellent condition.

The fatal result in one of these three cases was directly the result of an operation badly done. With the recent technical advances the risk has been lowered very much, and I feel that in time the more radical operation will be done much more frequently as being conservative in the long run.

To determine the characters of the ulcers such as these patients exhibited is impossible without microscopical examination. To err on the side of caution and perform pylorectomy or gastrectomy is wiser than to err the other way, as was done in one of my ulcer cases where death from carcinoma resulted.

Unsatisfactory cases, not malignant:

No. 48. Male, 68 years old. Entered the City Hospital in April, 1903.

His illness began with vomiting after a Thanksgiving dinner in November, 1903. The vomiting had continued and increased in frequency until at entrance the patient vomited two or three times a day. He had never seen blood and had complained of but little pain except at the outset. He had lost from thirty to forty lbs. in weight.

Examination of the stomach contents showed an excessive amount of residue, absence of free hydrochloric acid and presence of lactic acid. No blood was found. Two days after entrance to the medical service he was transferred to the surgical service for operation, when he was found weak, slightly cyanotic, in poor general condition, with prominent epigastrium and visible peristalsis of the stomach. Some blood was found on a later examination of the stomach contents. The patient was too sick for operation and for five days was fed on enemata in the hopes of getting him into condition for interference. He had grown stupid and delirious and the operation was done as a desperate resort.

Under cocaine (the patient being too ill for general anæsthesia), a loop of jejunum was drawn out and a catheter fastened in, nourishment being given at once. There was some shock even from this slight operation. He was fed frequently through the catheter, but steadily grew worse and died of starvation thirty-six hours after operation.

No. 49. Male, 55 years old, was operated upon by myself at the City Hospital in 1902, for supposed cancer of the descending colon, when a band of adhesions was found in the left iliac fossa obstructing the sigmoid. These adhesions were evidently of very old origin, and as exploration of the appendix region showed a lot of old adhesions in that location, the diagnosis of old appendicitis was naturally made. Twenty years before that, he had been treated at the Mass. General Hospital for acute abdominal inflammation. He was discharged in a short time, relieved of his bowel difficulty, but in Oct. 1903, he came to the Carney Hospital with an additional history of soreness in his stomach, persisting for years, with vomiting of a foamy substance, occasionally bilious, and vomiting also of food eaten one or two days before, with

relief to the pain. He was still constipated, but complained of no symptoms of bowel obstruction. He had been a steady, hard drinker for years.

At operation the loop of sigmoid freed at the previous operation appeared normal. In the duodenum close to the pylorus was a stellate scar, with adherent omentum, dragging the pyloric portion downwards and apparently causing a kink. The pylorus was open and not indurated. The stomach was not dilated. The gastrohepatic omentum was shortened, after freeing the pyloric adhesions, carrying the body of the stomach upwards and relieving the sagging at the pyloric end. The wound was closed in layers and the patient went out, gaining in weight and eating food without trouble.

It is fair to presume that the adhesions in the lower part of the abdomen followed an old perforating ulcer of the duodenum.

No. 50. Female, 35 years old. Referred by Dr. Smithwick.

A neurotic patient with stomach trouble for a number of years, growing worse in the last two years. She complained of much gas, distress, thumping sensation in the left side, especially, and eructations. Food apparently caused pain. She vomited severely before medical treatment, but under diet had vomited only occasionally. Constipated. Lower border of stomach two inches below the umbilicus.

At operation, at the Carney Hospital, a sagging stomach, without evidence of ulcers, was found, the pylorus being relatively high but open, though irritable. The gastrohepatic omentum was shortened with catgut, lifting the lower border of the stomach nearly up to its normal level, that is to say almost perpendicular. The abdominal wound was closed in layers.

The later history of this patient has not been obtained, but it is doubtful if she received marked benefit.

No. 51. Male, 52 years old, entered the Carney Hospital Dec., 1903, with an obscure history, suggesting persistent hemorrhage from a duodenal ulcer. He was markedly neurasthenic, moderately alcoholic, and since spring had had some vomiting, without blood, and had been unable

to work all summer. Nothing definite could be found on examination and exploratory operation was advised.

The stomach was found U-shaped, with a stretched gastrohepatic ligament; not dilated under ether. There was no sign of ulcer. The pylorus admitted the finger easily. The liver was slightly prolapsed. Examination of the abdomen elsewhere was negative except that some large, hard nodes were found near the appendix.

A second incision was made through the rectus over the appendix, which was found small and normal, but in the mesentery opposite the iliocecal valve was a hard gland, with contracted adherent peritoneum and from this in various directions were smaller indurated discrete glands, one of which was removed for diagnosis. Careful search failed to show any evidence of the primary lesion. The gastrohepatic ligament was then shortened, raising the lesser curvature to a normal angle. Both wounds were closed in layers. Pathological diagnosis of the gland removed showed "obsolete tuberculosis, presumably."

The patient improved somewhat and was about ready for discharge, when he developed a facial erysipelas, and was transferred to the City Hospital, where he died ten days later of the erysipelas.

These three cases were unsatisfactory, illustrating the unwisdom of half-way measures. It is doubtful if suturing the omentum is enough less serious to make it preferable to operations more radical. Combined with some form of anastomosis it is quite satisfactory.

No. 52. Female, 39 years old. Entered the City Hospital in Aug., 1901, with a history of persistent bleeding by mouth and rectum.

An operation before collapse had come on was advised. For two years previously she had been troubled with indigestion but without symptoms as severe as the present. Two weeks before entrance she began to have severe pain immediately upon eating, and tenderness in the epigastrium, but without vomiting. She then limited herself to liquid diet, and forty-eight hours before entrance vomited and passed blood by stools. The vomiting had continued steadily up to entrance and she passed several bloody stools. There

was considerable pain. She was markedly pale, with irregular intermittent pulse, retracted abdomen, and some tenderness in the epigastrium.

At operation the stomach was opened and explored with the finger, and although it contained considerable liquid and digested blood no ulceration could be felt or seen, though its walls were not examined thoroughly in the hurry of the operation. A button anastomosis was made and the abdomen closed. The patient, in poor condition at the start, stood the operation well.

The following day she still vomited blood and had five rectal hemorrhages, while the pulse and temperature steadily rose. The following day she had rectal hemorrhages, but without vomiting. Three days after operation she died, and partial autopsy showed no peritonitis as the cause of death.

No. 53. Female, 37 years old, entered the City Hospital Nov., 1902.

About a year before this the patient had had uremia following childbirth. Then followed much vomiting, treated by lavage. At times she vomited retained food in large quantities. She entered the Medical Side and was under treatment for over a month, being treated for dysentery and diarrhea, with relief. Improvement in her gastric symptoms followed lavage, but there was no gain in weight and recently there has been a relapse of vomiting of large amounts of undigested food, but without blood. The patient was in poor condition, emaciated, and with plainly visible peristalsis.

The gastric contents showed no free hydrochloric acid nor lactic acid. The stomach, apparently dilated at entrance, resumed its normal limits gradually, but, in spite of that, the symptoms referred to grew worse and she was transferred to the surgical service for operation.

At operation there was no distention of the stomach, but the small gut was distended; there was marked spasm of the pyloric end of the duodenum, practically closing the lumen for several inches; no tumor nor scars were found, while a hurried examination of the abdominal cavity failed to show anything definite, the patient being too ill for extensive search. An anterior button anastomosis was made,

the joints being reinforced with omentum. The wound was closed in layers. The patient came out of the ether well, but failed rapidly and died within twelve hours.

Partial autopsy showed tubercular colitis and tubercular ulcer of the duodenum.

No. 54. Male, 29. Entered the City Hospital in May, 1903.

The patient was a hard drinker and came in with delirium tremens. Eight years before entrance he is said to have had an attack similar to the present one, lasting four weeks, vomiting blood three times during the attack. Six weeks before entrance, after hard drinking, he vomited blood and was in an out-of-town hospital for a week, with cessation of vomiting at the time of discharge. Four days before entrance he had epigastric pain, but without vomiting of blood. There was marked tenderness in the epigastric region, but under low, mild diet and rest the patient improved. Unwisely, operation was advised and performed. Nothing but thickening of the pylorus—but with free opening—was found. A posterior gastrojejunostomy by Mikulicz's method was done and the wound closed in layers.

The patient relapsed into his alcoholic condition a few days after operation, became delirious, cyanotic, and died four days after operation. This patient should have been left alone.

No. 52 died as a result of operation done early in my series when the technique was much less simple than at the present time.

No. 53 was hardly a case for interference and operation was offered as a last resort.

No. 54 should never have been touched. It was bad judgment to have attempted anything surgical.

No. 55. Male, 53 years old. Referred by Dr. Peirce, of Norfolk Downs.

For a number of years he had had epigastric pain and a year ago began vomiting after supper. Six months later the vomiting attacks came on more often and five days before I saw him he had had copious vomiting, preceded by

severe gastric pain. Always constipated. The amount of vomitus was excessive. He had never noticed blood nor coffee grounds. He had lost much weight and recently had lost much strength.

Examination showed a retracted abdomen, with dilated stomach, but without definite tumor.

At operation, Dec., 1902, at the Quincy Hospital, in the front wall of the pylorus and extending in under the surface, were old scars and adhesions. The tissues about the pylorus formed a swelling the size of a hen's egg, but without induration, like a malignant growth. The pyloric opening was practically closed. This mass was adherent to the right lower edge of the lesser omentum, the duodenum lying behind some sheets of peritoneum that were apparently adhesions. The duodenum was freed and a gastroduodenostomy by Finney's method was done. The pylorus was so adherent that, in trying to separate it, the cavity was torn into and had to be temporarily closed with catgut. Abdominal wound closed, allowing for a temporary wick drain to the line of sutures. Patient in good condition at the close.

He vomited more or less for a day or two after operation and inhaled some vomitus, which started up a bronchitis—from which he rapidly succumbed. Examination through the wound showed no peritonitis.

Although this patient died from inhalation pneumonia the operation must take the blame for the result. At present I am sure the outlook would be far more favorable.

No. 56. Male, 45 years old. Referred to me by Dr. Lawrence, of Brockton.

Three years ago he had an attack of pain in the stomach, without vomiting, lasting for three months. A year later he had a return of the symptoms, lasting the same time. One year ago the symptoms returned for the second time and persisted up to the time that I saw him, in September, 1903, when I found pain in the left loin and hypochondrium, with eructations of gas, relieved by the use of the stomach tube for the last two or three months. For over a year, after eating anything, he had complained of pain, lasting two or three hours, without nausea, and he had been

very much constipated for months. He stated that a year ago he had tarry stools. When the pain in the stomach began he would lie down with relief. There was no history of retained food. He had lost much weight in the last year. There was some dilation of the stomach, with slight tenderness, and, possibly, thickening under the left hypochondrium. Nothing suggestive of an aortic lesion was found in examination of the chest and hence the aneurism from which he died was entirely unsuspected.

Examination of the stomach contents showed absence of free hydrochloric acid and much diminished combined hydrochloric acid.

At operation at the Carney Hospital, the liver and stomach were both found prolapsed, with a slight thickening at the pylorus. The gastrohepatic omentum was shortened and a posterior gastroenterostomy, with clamps and sutures, was made. A little blood was found within the stomach at the time of operation. The liver was sutured up into place, and the wound closed in layers. The patient progressed satisfactorily and was beginning to eat, when, five days after operation, he suddenly vomited up a large amount of fresh blood and died.

Autopsy showed a ruptured aneurism of the thoracic aorta, emptying into the pleura. There was no gastric ulcer to be found.

No. 57. Male, 65 years old, had suffered from stomach trouble for six years, beginning with sharp, stabbing pain in the right side. He had vomited much and thought he had vomited coffee grounds. He had lost much weight in the last six months and was unable to work. On entrance to the Carney Hospital, in Oct., 1903, he was markedly emaciated and starved. Operation was urged to prevent death from starvation if possible.

At operation, in the region of the duodenum and gall bladder there was a general mass of old adhesions, the gall bladder being so covered over that it was not distinguishable. In the adhesions were old scars as though from a perforating ulcer. Nothing abnormal was felt in the stomach or elsewhere in the abdomen. The pylorus when relaxed admitted the finger, but it quickly thickened spasmodically and formed a hard, nodular tumor. A posterior gastroenterostomy, with

clamps and suture, was done and the wound closed. After operation the patient continued vomiting more or less steadily, growing weaker, not deriving any benefit from his rectal or stomach feeding, when finally the vomiting became persistent and ten days after operation he died.

Examination through the wound showed that there was no peritonitis nor obvious cause for death.

The outcome of this case was not anticipated before operation. It may have been a case of "vicious circle," but as we watched him it seemed more like death from prolonged starvation from which the patient was too weak to react. Technically the operation seemed most satisfactory, but in the light of a few other bad results it is fairer to ascribe the result to some operative defect.

No. 58. A boy three months old. Entered the Carney Hospital in Nov., 1903. Referred to me by Dr. C. W. Townsend, who has reported the case in full in the Boston Medical and Surgical Journal for Feb. 11, 1904.

A brief history of the case showed almost persistent vomiting, with occasional intervals, from the time he was three weeks old, progressive emaciation and starvation, and a dilated stomach. Operation was advised as a last resort.

The stomach was found dilated, and the intestine collapsed. At the pylorus was an oval fibrous, solid tumor, half to three-fourths of an inch in diameter, apparently almost or completely obstructing the lumen. A posterior gastroenterostomy, with clamps and sutures, was done, the omentum and mesocolon being found mere films, without trace of fat. Wound closed in layers. The baby recovered from the operation and seemed to hold its own, taking small amounts of hot water by mouth and retaining this fairly well, but eighteen hours after operation it vomited about four ounces of digested blood and bile and collapsed. Later it vomited more dark blood and bile and died twenty-four hours after operation.

Pathological report showed a hypertrophy of the pylorus, with the associated narrowing of its lumen.

This case suggests strongly the wisdom of early interference in infants with persistent vomiting not explainable on

dietary errors. In such cases the operation is probably very safe and it is most probable that these cases are more common than the general practioner realizes.

No. 59. Male, 26 years old, was seen with Dr. McCook at Hartford a short time before operation.

The history obtained at that time pointed to acute gastric ulcer and operation was advised. The full history obtained later, through the courtesy of Dr. McCook, is as follows: Nine years before he had had a sharp attack of indigestion with vomiting and abdominal pain. In 1898 he was in bed three months with inflammatory rheumatism and for the following six months he had a number of fainting attacks. In 1899 there was cough and expectoration, for which he went to Kentucky. He recovered and remained well until seven weeks before I saw him, when diarrhea began, lasting a couple of days, followed by vomiting, which had persisted up to the time of operation. The vomiting came on at variable times after eating and he could hold nothing on his stomach except hot milk. Constipation was marked during the attacks of vomiting. For two weeks he had complained of dull pain in the abdomen, with occasional sharp pain in the right epigastrium. Once he noticed some bright blood in the vomit and had noticed, also, dark stools. There was slight tenderness over McBurney's point, loss of weight, and a normal white count and urine. Stomach contents showed absence of hydrochloric acid and presence of lactic acid, absence of blood, a little mucus and some bile. At consultation, when I saw him, the diagnosis lay between gastric ulcer, with pyloric obstruction, and a gastric neurosis.

At operation at the Hartford Hospital, an exploration of the gall bladder and appendix regions, etc., were negative. No ulcer could be felt in the stomach. The pylorus was open. Nothing could be felt in the duodenum. A posterior gastroenterostomy was made by Mikulicz's method and the abdominal wound closed.

There was no shock following the operation, but vomiting began at once. He was kept on rectal feeding for five days. Then boiled water was given him by mouth, which he vomited at once. Delirium then began and continued until death eight days after operation. On removal of the silkworm gut sutures a small stitch abscess was found. Otherwise the

wound healed well. The temperature rose at once after operation and continued at about 101° until just before death, when it rose to 104°. The pulse, 90 to 100 for the first week, rose to 120 and thence higher until death.

An examination was allowed only through the wound. A little bloody serum was found in the abdominal wound. There was no peritonitis. The joint was tight. No ulcer of the stomach was found and no pyloric stenosis. The kidneys were slightly congested, and there were a few new adhesions (probably from operation) near the umbilicus. The appendix showed chronic inflammation, the tip being under the border of the ribs; and from the appendix an old fibrous band extended to the side of the abdomen under the liver, which looped up to the appendix. The exact insertion of this band could not be made out with the limited incision permitted. Unless this band from the appendix, which was overlooked at the time of operation, was the cause of the vomiting, through constriction of the gut, there is no way to explain the symptoms nor the cause of death. The intestine at operation was not distended, but as in case No. 67 it may be possible that the vomiting was reflex from dragging of the small gut but without constriction sufficient to produce obstruction.

No. 60. Female, 28 years old, entered the City Hospital in Sept., 1901. For a number of years she had had stomach trouble, with vomiting an hour or two after eating, nausea and epigastric pain. This had persisted up to the present time. Three years ago she had a severe epigastric attack, vomited blood after eating and passed blood by rectum. This attack was repeated two months, three weeks and four days, respectively, before she entered the Hospital. There was a history of vomiting retained food. Almost every night after midnight she would vomit excessive amounts. She had lost weight and for nine months there had been marked tenderness in the epigastrium. Recently she had noticed a bunch in the same region. Analysis of the stomach contents showed dilatation, stasis, free hydrochloric acid, and a small amount of lactic acid. She had previously had a laparotomy for ovarian trouble.

At operation the omentum was found adherent to the old laparotomy wound. The stomach showed nothing definite

on the outside. A posterior anastomosis was made with silk and catgut by the old method. Exploration showed that the pylorus admitted the finger and no ulcers could be felt on either wall. Abdominal wound was closed. After operation she vomited somewhat but less than before, and nearly three weeks later developed a phlebitis of the left leg. A month after operation, as she still had occasional vomiting, the stomach was washed out and analysis showed that there was still dilatation and stasis, no blood, no free hydrochloric acid, and diminished combined hydrochloric acid. Two months after operation she was discharged, a little improved, having refused to have any further interference. Taken in conjunction with several later cases the possible effect of an omentum adherent to the scar of a former laparotomy must be considered in diagnosticating gastric lesions.

No. 61. Female, 28 years old. Was referred to me in Oct., 1902, by Dr. Smithwick. She was a neurotic woman, nearly unbalanced, mentally, and the entire history must be taken with considerable latitude.

She had complained for five or six years of headache and constipation without definite stomach symptoms. She had never had vomiting, nor lost weight, and complained more of general debility and constipation than anything. Examination showed dilatation of the stomach. As there was a fairly definite specific history the patient was put on potassium iodid and operation advised against. In Aug., 1903, she returned again, having received benefit from the iodid for a while, followed by relapse, with symptoms worse than ever. An exploratory laparotomy on basis of probable ulcer of pylorus was advised but not urged.

At operation, at the Boothby Hospital, the stomach was found dilated. At the pylorus, on the proximal side, and extending for about an inch in the greater curvature, marked induration could be felt. In the lesser curvature was a small nodule suggesting another ulcer or scar. The pylorus itself was not narrowed. There were large lymph nodes along the lower border. Elsewhere the abdomen was negative. A posterior gastroenterostomy by Mikulicz's method, but using clamps to control hemorrhage and leakage, was made. The abdominal wound was closed in

layers. She convalesced well, had no nausea, and was discharged about ten days after operation.

Later it was learned that the symptoms had relapsed and that the operation had been of no benefit, as might have been anticipated from the first. At present she is receiving marked benefit from the treatment of one of our irregular practitioners and considers herself nearly well.

No. 62. Female, 32 years old. Came to me in Feb., 1903, with a long history of many operations.

Within the last two or three years she had had an exploratory operation for supposed movable kidney, a cholecystectomy, an operation for adhesions following this latter, nephrorrhaphy, then later an appendectomy. From all these operations she had derived no relief and she came with persistent pain night and day, nausea, occasional vomiting and general discouragement.

Operation was done at the Boothby Hospital, and the gall bladder, full of gall stones, was removed. The adhesions in that part of the abdomen were formidable and made the operation difficult. After operation she complained steadily of pain deep in the abdomen, not severe but persistent and dull and followed by vomiting. She begged for further operation for relief, which was unwisely consented to. Under chloroform the abdomen was again explored. Nothing definite was found beyond the general mass of adhesions dragging the liver downwards and pulling the duodenum far to the right and forwards. In separating the adhesions the duodenum was opened and examination through this tear showed the pylorus free and without induration. The tear in the duodenum was closed, but the tissues were so abnormal that it seemed wiser, if possible, to prevent leakage by doing a gastroenterostomy at once. So the abdomen was opened in the median line and an anterior button anastomosis made at the same time.

About ten days afterwards, leakage of bile and pancreatic fluid appeared in the lateral wound and this continued for a number of weeks.

At the time of the first operation there were evidences of pulmonary tuberculosis. These increased after being in the Hospital a few weeks, while the biliary sinus closed gradually. The patient steadily lost ground and was sent

into the country on account of her tuberculous condition, where she probably died shortly afterward.

No. 63. Female, 39 years old, referred to me by Dr. Hodgkins, of Castleton, Vt., in July, 1903.

She had been under medical treatment for stomach trouble for two years, the symptoms steadily growing worse. In Feb., preceding, she began to have hemorrhages, much pain after eating, and tenderness in the epigastrium. All these symptoms had steadily increased, with some loss of weight.

Operation, August, at the Carney Hospital. The stomach was found slightly dilated, the pylorus apparently normal, but alongside of it a small area of thickening suggesting an ulcer. A posterior gastroenterostomy, with clamps and sutures, was made and the wound closed in layers.

The patient's stomach symptoms at once ceased and at the end of four weeks she returned home, eating regular food without any symptoms. During convalescence there was a stitch abcess, due to some technical error at the time of operation. Three weeks after leaving the Hospital vomiting began again and she returned in November with a history of persistent vomiting day and night, coming on one to two hours after eating. No hematemesis. She stated that just before the vomiting attacks recurred, she had fallen forward striking the abdomen; but it is doubtful if that had any direct influence in the relapse. She still complained of severe pain in the left side, relieved by vomiting or catharsis.

At the second operation there were no adhesions to the old scar, but a portion of the omentum at the right border of the stomach was found adherent far to the left of the median line, pulling the right portion of the greater curvature leftwards and lapping this portion of the stomach over the main portion. This adhesion was freed and the raw ends covered over. At the anastomosis there was a thin sheet of adhesions puckering the distal arm of the jejunum close to the anastomosis so that the gut was folded upon itself into a Z-shaped loop, apparently blocking the lumen to a considerable extent. The anastomotic opening was free and without evidence of constriction. The sheet of adhe-

sions was ligated and freed, the jejunum being easily drawn out to its normal straight line. In addition to this the mesentery opposite the opening was shortened upon itself and sutured, in order to counteract any tendency of the mesenteric border of the gut to form a valve. Nothing abnormal elsewhere was found. The wound was closed in layers and the patient recovered promptly and was discharged, eating solid food without vomiting and perfectly well. It is probable that the sepsis which had produced the stitch abcess infected at the same time the peritoneum at the site of anastomosis, making the troublesome kink. Almost as soon as the patient had arrived at her home vomiting returned, and when heard from in April last she had vomited persistently ever since, some hours after eating. Efforts were made to induce her to submit herself again to operation, but without success. I have no question but that the condition could now be entirely relieved.

No. 64. Male, 29 years old. Entered the Carney Hospital in Sept., 1903. Referred by Dr. Smithwick and Dr. G. N. Jones, with a history of dyspepsia for two years, gradual in its onset, distress after meals and latterly even before meals. The duration of the pain varied and relief was obtained by drinking hot water, followed by eructation. He had never vomited and had never had nausea. He had been under all forms of medical treatment and diet, but without benefit. He had lost weight, was unable to work on account of his nervous condition, and operation was advised in the hopes of finding some definite organic cause. Lavage had shown some blood in the later washings. A small, diffuse mass could be felt in the region of the pylorus, moving with respiration. This region was the seat of his pain and tenderness.

At operation the stomach was found moderately dilated. There were no outside evidences of ulcer. The pylorus was free. There were no adhesions. Nothing could be found to account for the trouble beyond the possibility of minute ulcers or a small ulcer of the duodenum undetected from the outside. Posterior gastroenterostomy was done in the usual way, and the wound was closed in layers. The patient convalesced satisfactorily and at the end of two weeks was discharged, able to eat almost anything.

Feb., 1904, he wrote that he had not derived great benefit. He had gained weight and strength gradually, but was still troubled a good deal with gas. Up to Dec. 1st, there had been no return of his former trouble. Then he began to have the same distressed feeling and had had several attacks that persisted pretty steadily for some days. He described his trouble as lasting for about a week, followed by relief for two weeks and then returning. He is living regularly and his work is easy, but it is evidently a functional rather than an organic trouble.

No. 65. Female, 37 years old.

In all probability addicted to the use of opium and cocaine. Referred to me by Dr. Twitchell in Dec., 1903. She was a marked neurasthenic and came with a history of attacks of faintness, severe pains across the upper abdomen, bleeding for a year, constipation, and enforced limitation in diet for a number of years. She complained of distress an hour or more after eating, and described it as very severe, the griping being followed by flatulence and distention. The diagnosis was extremely uncertain and an exploration was advised on the chances of finding some organic trouble.

At operation, at the Carney Hospital, the liver was found prolapsed, the stomach prolapsed and dilated, the transverse colon was found adherent to the sharp edge of the extreme right portion of the liver, dragging this portion of the lobe two to three inches past the main portion, where it was held by old, firm adhesions, backwards against the duodenum and gall bladder, the latter being buried beneath the adhesions. The gall bladder after being freed appeared normal. The pylorus was found irritable at examination but admitting the finger. Examination of the stomach, pelvis, etc., negative. All the adhesions were freed, the colon was replaced, and a posterior gastroenterostomy, in the usual way, was done. The mesocolon was found abnormally adherent to the posterior wall, suggesting patches of scar tissue. The wound was closed in layers. The patient made a satisfactory convalescence and was discharged in two weeks, eating the regular food without symptoms.

Since her discharge it has been reported that the patient has had more or less return of her old trouble, but whether due to her neurotic condition or to any true stomach lesion is very doubtful.

This case (No. 65) with Nos. 62 and 64 are pretty good examples of the sort of case that should be let alone. When the neurotic element is predominant, even if there is some slight organic lesion to start the explosion, it is doubtful if anything more than a temporary benefit will be gained by operation. Such cases are best treated medically and psychologically judging from this limited experience.

No. 66. Female, 36 years old. Was referred to me by Dr. Johnson, of Winthrop, with a history of persistent hemorrhage from the rectum, supposedly from hemorrhoids. She had had several pelvic operations in times past and came with a history of prolapse and rectal bleeding for two years, with poor appetite and indigestion for some months.

At operation for the hemorrhoids practically nothing abnormal was found to account for the hemorrhage, but what small varicosities there were were clamped and cauterized.

About a week after operation she had a severe hemorrhage from the bowels, with dark stools, repeated in a few days, and it was evident that the blood had not come from the rectum. She complained at the same time of pain in the stomach region and was evidently losing blood from some region high up in the intestinal tract. A more careful investigation of her history pointed to old gastric trouble and at the second operation, at the Carney Hospital, the liver was found prolapsed, the stomach markedly prolapsed, the lesser curvature being at the level of the umbilicus — the gall bladder was adherent to the omentum by old adhesions and drawn out of its normal position. Around the duodenum the adhesions were more marked. Most of these adhesions were separated and ligated and the gall bladder was sutured to the liver in its normal position. Exploration of the pelvis showed nothing abnormal. An examination of the intestines showed nothing abnormal except for some dark contents suggesting blood. The dilated U-shaped stomach was all that could be found pathological. Consequently a posterior gastroenterostomy, in the usual way, was performed. The mesocolon was found adherent to the posterior wall so that the lesser cavity could not be explored. The gastrohepatic omentum was shortened, lifting the lesser curvature to its normal position. The wound was closed in layers.

The operation was a long one and the patient had moderate shock. Examination of the stomach before operation showed stasis, dilation, free hydrochloric acid. The patient was discharged in about two weeks, enjoying ordinary diet and with a better appetite than she had had for years.

In April she reported that after leaving the Hospital she was well for a month, when she began to vomit again, at first in small quantities. She sometimes vomited at once after eating and at other times several hours. Occasionally she would go an entire week without vomiting, only to have it return every day for a short spell. No difference in diet affected the vomiting. She had had no hemorrhage, was looking well, and had not lost weight. By percussion the stomach seemed to be somewhat prolapsed and dilated, the lower border being at the level of the umbilicus. She was urged to re-enter the Hospital for a second operation, with the idea of having an enteroenterostomy or whatever other procedure might be found necessary.

This case and No. 63 were most disappointing. There must be some technical error to explain the relapses, but I feel so sure that it can be overcome by an enteroenterostomy or a pylorectomy that I would urge another attempt with great confidence.

No. 67. Female, 49 years old. Entered the Medical Side of the Carney Hospital in April, 1904, after an attack of vomiting for three weeks, latterly persisting day and night, in which she had never noticed blood nor coffee grounds. The patient was very sick, with dry skin, and in bad general condition.

At operation, at the pyloric end of the stomach and the duodenum were old adhesions to the gall bladder and neighboring region, pulling the gall bladder to the left and apparently obstructing the duodenum. After freeing these the pylorus was found to be open but with a slight thickening close by it as from an old scar. Elsewhere in the stomach nothing abnormal could be detected. A posterior gastroenterostomy was done in the usual way and the mesocolon was found firmly adherent to the stomach towards the pyloric end. A hurried examination of the abdomen else-

where showed nothing pathological. The wound was closed in layers.

This patient did not do well after operation. The vomiting was relieved somewhat, then returned again, and three weeks after the first operation the abdomen was reopened and the anastomosis was found free, with apparently excellent drainage into the jejunum. There were a few adhesions of the proximal portions of the gut to the stomach, not causing a kink. At the mesenteric edges of the proximal portion of the gut opposite the edge of the anastomosis, there was thickening of the gut with radiating scars of the peritoneal coat, so that the lumen was partially closed. The proximal portion of the jejunum was a little heavier and more dilated than the distal. The thickening and scar suggested peptic ulcer, as the occlusion seemed to be internal and not from any external lesion. Enteroenterostomy was made with clamps and sutures and the wound closed in layers. Vomiting persisted after this second operation and the patient steadily lost ground and died in a few weeks.

Autopsy by Dr. Magrath. Appendix and lymph nodes normal. Transverse colon widely distended with gas. Pylorus adherent lightly by fibrous adhesions to liver. Opening in posterior wall of stomach 2.5 cm., communicating with the small intestine. Pylorus admits tip of finger. 50 cm. from beginning of jejunum to anastomosis. Left pleural cavity shows fibrous adhesions. Right normal. Pericardial fluid 250 c.c. Myocardium flabby, left ventricle dilated, 9.5 cm. in depth. Lungs alike, voluminous. Base of left slightly increased in consistency, due to small areas of focal pneumonia in a region of partial atalectasis. Both lungs edematous. Spleen 11 cm. in length; pulp slightly increased, composition normal. A coil of ileum 15 cm. from the cecum was united by fibrous adhesions to the floor of the pelvis. Liver and kidneys negative. Aorta normal.

The only cause for the vomiting that seemed possible was the dragging of the ileum by its pelvic adhesion, overlooked at operation because examination of the proximal half of the small intestine failed to show any signs of obstruction lower down. This dragging may have caused the vomiting by reflex action; there certainly was no obstruction.

No. 69. Female, 54 years old, entered the Carney Hospital in March, 1904, on the Medical Side, with indefinite gastric symptoms. She was transferred to the Surgical Side, and under operation a gall bladder full of stones, and an enlarged mass in the region of the pancreas, supposed to be chronic pancreatitis, was detected. The stomach was found prolapsed but not dilated. She gained somewhat, but a month later the gall bladder fistula was reopened because of return of supposed pancreatic symptoms. The stomach began then to give her trouble, and the patient was fast becoming unable to hold any food on her stomach. A gastroenterostomy was advised as a temporary measure. At operation the retroperitoneal growth had increased and a section from this mass showed, on examination, that the tumor was a retroperitoneal sarcoma and not a chronic pancreatitis, as had been anticipated. A button anastomosis was made and the wound closed.

The patient derived relief from the anastomosis, but gradually failed and died of malignant exhaustion a few weeks later.

No. 70. Female, 44 years old, referred by Dr. H. D. Arnold, entered the City Hospital in Sept., 1901.

A year and a half previously she had vomited blood and was fed by rectum for three weeks. Soreness in the epigastrium persisted and six months before entrance she had had severe pain which had recurred off and on ever since. There was no history of passing blood by rectum and she complained of general weakness, soreness in the epigastrium, and sharp pain not related to taking food. Gastric analysis showed free hydrochloric acid present; no stasis; a slight quantity of blood and pus in the washings.

At operation the stomach was found normal in size and on the anterior wall was an indurated, round ulcer midway in the lesser curvature. A posterior gastroenterostomy, without clamps, was done with silk and catgut. Exploration through the stomach opening showed an ulcer with slightly raised, indurated edges and a more or less fissured base, in the anterior wall. Abdominal wound closed in layers.

Patient improved a good deal after operation, but had some vomiting, and two weeks after operation developed

phlebitis of the left leg. She then gradually improved and her vomiting practically ceased, and she was discharged from the Hospital in fair condition.

In Jan., 1903, over a year afterwards, I was again asked to see the patient and learned that she had had no vomiting after return from the Hospital, but that recently she had had more or less dyspepsia and had again been obliged to limit her diet. For two or three months she had complained again of the griping pains and latterly these pains had been as severe as ever. Constipation had been a marked symptom. Examination showed in the left hypochondrium and umbilical region a tumor, superficial, hard in the left lower portion, and merging upwards and to the right, towards the right hypochondrium. The tumor was apparently in the stomach and exploration was advised.

At the second operation, at the Boothby Hospital, there was found an excess of abdominal fluid and a large mass in the stomach at the site of the old ulcer, with infiltration in the walls extending into the omentum and colon and apparently throughout the abdomen generally. There were extensive adhesions of the intestine to the stomach and omentum but the anastomosis was found patent. The old ulcer had either degenerated into a carcinoma or was already carcinomatous at the time of the first operation and not recognized. Nothing more could be done and the wound was closed.

The patient lived several months fairly comfortably and died of general carcinoma.

The twenty-four cases from No. 71 upwards include the more or less satisfactory results from anastomosis where the lesions were not malignant. The operations have been done too recently to make them of any value on the basis of end results. But the immediate results have been satisfactory and they are offered for what they are worth on that basis, and because they illustrate in the operative findings varied and interesting pathological conditions for which clinical explanations can usually be found.

No. 71. Female, 44 years old. Entered the City Hospital in Nov., 1902.

Had had bilious attacks, with vomiting and headache, ever since she was twelve years old. For three weeks she had had considerable vomiting, coming on an hour or two after eating, with epigastric pain, relieved by the vomiting. Had never vomited blood until two days before entrance, and had lost 25 lbs. in the last three years.

At operation a dilated stomach, with well marked scars at the pylorus, was found, without evidence of its being malignant. There were a few old adhesions of the omentum to the duodenum. The gall bladder was negative. A gastroduodenostomy, by Finney's method, was done and the wound closed in layers.

Three days after operation she had some vomiting, which was relieved by lavage. The vomiting then ceased and the patient steadily convalesced, and was discharged a month after operation, without gastric symptoms and in good general condition. Her later history has been lost sight of.

No. 72. Female, 33 years old, entered the City Hospital in Nov., 1902. She had been operated upon in the gynecological service a month before, for tubal and ovarian trouble. She was then transferred to the medical service, on account of almost continual vomiting day and night, which continued in spite of treatment. Her history showed that four years before entrance she had had a rather severe attack of vomiting, with epigastric pain lasting a week, with a little blood and bile in the vomitus. She then had no further trouble up to four months before entrance, except that she had been obliged to steadily restrict her diet in order to avoid gastric distress. At transfer to the Surgical Side the patient was seriously ill, with hollow, flushed cheeks, tender epigastrium and persistent, exhausting vomiting.

At operation the duodenum and pylorus were found firmly held to the posterior wall by old adhesions of unknown origin. Some of these were ligated and freed. No growth could be felt in the stomach. An anterior button anastomosis was made as quickly as possible, the patient being too ill to allow of careful examination. The upper jejunum was distended beyond normal, but it was impossible to determine whether it was due to any pathological lesion below that point.

After the operation the patient vomited almost without cessation and steadily grew weaker, but she retained her nutrients well and by six days she was able to take a little nourishment by mouth. Gradually the vomiting quieted down and in time she gained strength, appetite, and was discharged six weeks after operation, without symptoms and in fairly good condition.

In Sept., 1903, she reported that she had gained 35 lbs., that she had had occasional vomiting since leaving the Hospital, and that in May, after a severe attack of vomiting and strangling, she felt something sticking in her throat, which she vomited up, and which she described as a blood clot the size of a small egg. It probably was the button, which had slipped into the stomach and was thrown up in this way, although the vomitus was not examined at the time. She was more or less sore afterward, as though some metal substance had scraped her esophagus, but since then she had had less dyspepsia and vomiting. About once a month she had some nausea and vomiting, but was able to do her own housework, eating simple food.

In April 1904, she reported to the Gynecological Department that she still vomited blood at times, but was under treatment for pelvic trouble.

No. 73. Female, 20 years old. Referred by Dr. Ferguson in April 1903.

For two years she had had epigastric pain, coming on after eating, with, at times, vomiting of blood. A year before I saw her there was pain and vomiting immediately after eating, with epigastric tenderness, and she was obliged to give up her work. At that time she developed tuberculosis of the lungs and was treated accordingly, with considerable relief to her pulmonary trouble. She was unable to eat solid food without severe epigastric pain. There was diminished hydrochloric acid in the stomach contents and examination suggested functional rather than organic disease. She was anemic and operation was advised more in the way of exploration than with a view to finding any organic lesion.

At operation at the Boothby Hospital, the stomach was found somewhat dilated and there was some induration, but the lumen was normal and along the greater curvature some

enlarged lymph nodes were found. The examination of the interior of the stomach showed a slight roughness close to the pylorus that suggested an ulcer or a scar. An anterior button anastomosis was made and the wound closed. The patient was in poor general condition and extensive operation was not permissible. Convalescence was satisfactory and she left the Hospital in good condition, relieved of her stomach symptoms.

No. 74. Female, 21 years old, had suffered from stomach trouble for five years. Three years ago she had had hemorrhage, preceded by epigastric pain, especially after eating, and at that time she had not only hemorrhage from the stomach but from the bowels. Was in bed four months, then had more or less retching and vomiting of coffee grounds, the vomiting coming on at once or about an hour after eating. Under the care of a stomach specialist she grew stronger and gained weight, but the conditions recurred about three months before I saw her and she began vomiting, lost weight, and suffered from pain in the epigastrium after eating, with relief from vomiting. Examination showed tenderness to the left of the median line in the epigastrium. The stomach was apparently contracted. On account of the long duration of her dyspepsia, the hematemesis, chronic invalidism, persistent pain in the epigastrium, and recurrence in spite of long medical treatment, exploration was advised.

At operation, at the Carney Hospital, Nov., 1903, the stomach was found sagging a little downwards and to the left, but the pylorus appeared free and open. Gall bladder region was negative. No scars nor evidence of ulcers could be seen on the outside of the stomach. A posterior gastroenterostomy, in the usual way, was done and the abdomen closed in layers. The stomach, at the time of the anastomosis, contained an excess of dark fluid blood, showing recent hemorrhage. Patient steadily gained in weight and strength and was discharged in three weeks, eating ordinary diet.

When seen in May of this year the patient was eating heartily of ordinary food, without trouble except that recently she had had some hiccough and was troubled with constipation. Both of these cleared up under simple remedies.

No. 75. Male, 76 years old. Was seen with Dr. Brown, of Newburyport in consultation, in Sept., 1903.

Three years before he had had a severe universal dermatitis, from which he had been entirely relieved. A year afterwards he began to have symptoms of duodenal ulcer, although for many years he had had indigestion, lasting for a week or more, coming on about two hours after meals, without vomiting, and ceased on milk diet. In attacks two years and one year ago he had had tarry stools and in the latter attack was in the Hospital on rectal feeding, for three weeks. The pain persisted, however, for some time after discharge, gradually subsiding. For a year he had dieted more or less, and when I saw him there had been fresh blood in the stools for two days. Previous to this the blood had always been digested. For a month he had had quite constantly a mild distress in the stomach, not relieved by milk diet. He was healthy, with slightly atheromatous arteries, and just above the umbilicus a small slightly tender swelling could be felt. Owing to his age and his success under rectal feeding in his preceding attacks operation was advised against. Two months later, not having gained at all and being obliged to resort to rectal feeding more or less of the time, operation was advised.

At operation, at the Newburyport Hospital, a thickened ulcer of the duodenum just beyond the pylorus was found, with recent adhesions and an appearance of beginning perforation. A posterior gastroenterostomy, with clamps, in the usual way, was made and the wound closed in layers. The patient made an uneventful recovery, without pain or vomiting, food was taken early, and three weeks later, at Thanksgiving, he was able to eat a complete dinner without distress. Up to the present time the patient remains perfectly well.

No. 76. A woman, 43 years old. Referred by Dr. Boland.

Patient had had emphysema for several years and for six months had had severe attacks of abdominal distress, at times so severe that she screamed with pain, being unable to lie down and obliged to sit up on the edge of the bed until exhausted. These attacks came on about midnight, rarely in the day time, and rarely was there vomiting. The

pain and distress were always referred to a point to the right, above the umbilicus. She had lost weight and looked badly. Examination showed absence of liver dulness in the normal situation. Both kidneys were prolapsed. The intestinal coils were plainly visible. So far as could be determined the severe attacks of asthma were caused by the gastric distress. Only partial relief could be obtained from nitrite of amyl. From the fifth rib downward the chest was markedly scaphoid.

During operation, at the Carney Hospital, in Dec., 1903, the patient was moderately cyanotic throughout, but had no attack of asthma. The liver was found prolapsed, lying entirely below the costal margin, the diaphragm itself lying almost on the level of the lower cartilages and the lower border of the right lobe at the level of the pelvic brim. The stomach, also, was prolapsed, as well as the first portion of the duodenum, but the second and third portions were apparently not depressed. The pylorus was thickened but not indurated, the lumen admitting the tip of the finger. The gall bladder and ducts were normal. A posterior gastroenterostomy, with clamps and sutures, was made, the mesocolon being found firmly adherent, in places, to the stomach, but no scars were seen.

The patient convalesced satisfactorily from the operation, her asthma disappeared, and in three weeks she was discharged, in good condition. Since then the stomach has caused no trouble but she still has asthmatic attacks.

No. 77. Male, 36 years old, was picked up, in August, on the railroad tracks, lying in a pool of vomited blood, and was brought to the Carney Hospital at once.

He had been feeling ill for a week and everything he ate caused distress. That morning, before the hemorrhage, he noticed a black stool, and felt weak and unable to go to work. While walking, on the railroad track, to his work, he felt weak and dizzy and vomited both food and blood. After admission he vomited blood a number of times, but refused operation. Adrenalin was given and at the end of three weeks he was discharged, relieved, in much better condition.

In December of the same year he returned, begging for operative relief, stating that three weeks after his discharge

he had felt pretty well and was able to work part of the day for a while, but then gave up because of weakness. He had had no vomiting since he left, but had been unable to eat ordinary food, and two weeks before entrance fainted. Examination showed him pale, with a sunken abdomen and soreness in the epigastrium.

At operation a contracted stomach, with open pylorus, was found, without evidence of scars or induration anteriorly. Posteriorly the mesocolon showed scars as from old inflammation, and towards the right was adherent to the stomach. A posterior gastroenterostomy, with clamps and sutures, was made and the abdomen closed in layers.

For two or three days the patient vomited considerable blood and passed blood by stool, but it was controlled by adrenalin and at the end of three weeks he was discharged, eating solid food, with marked gain in weight and color. Since then the patient has steadily gained and when last seen was as well as ever.

No. 78. Male, 45 years old. Entered the Carney Hospital in Oct., 1903.

In August he had epigastric pain and stasis, followed three weeks later by hematemesis. Since then he had spit up small amounts of blood once or twice a week. A few days before he had had a small hemorrhage, without nausea or vomiting, and he described a lump in his stomach from which the blood seemed to come. He had a good appetite, but he could not retain his food and was constipated. He had lost twenty-five pounds but had never noticed blood in the stools. Distress in the stomach came on after eating. Examination of the stomach showed badly digested food, free hydrochloric acid, no blood.

At operation, by Dr. Bottomley, scars and adhesions were found in the posterior wall near the pylorus. A posterior gastroenterostomy, with clamps and sutures, was made and the patient was discharged in three weeks, eating solid food without discomfort.

No. 79. Male, 67 years old, referred by Dr. Stubbs, of Newton.

The patient had complained of indigestion for two years and had been on medical treatment during that length of

time. In the beginning he had had lavage every second day for three weeks. This was followed by some relief for six months, then the symptoms returned and he obtained no relief from a repetition of the washings. Three months before I saw him he had had marked indigestion, without blood in the stools, the distress coming on two or three hours after eating or at times appearing in the middle of the night. It was described as a dull, heavy pain across the middle of the abdomen. Examination of the stomach showed the lower border an inch and a half below the umbilicus.

At operation, at the Carney Hospital, in Dec., 1903, a moderately dilated stomach was found and at the pylorus on the duodenal side was a tumor, not indurated like a malignant growth, apparently occluding the lumen and without lymph nodes in the neighborhood. A posterior gastroenterostomy, with clamps and sutures, was made.

The patient was discharged in about two weeks, eating and enjoying regular food, without having vomited at all, and up to the present time he is perfectly well, without any symptoms.

No. 80. Female, 27 years old, referred by Dr. T. J. Murphy.

Two years before I saw her she had had slight hematemesis, which had disappeared under restricted diet. A year ago she had a relapse lasting several months, accompanied by pain. Relief then followed for about five months, when she consulted Dr. Murphy, complaining of sharp epigastric pain not severe enough at the time to suggest a perforation. Under treatment this subsided until two weeks ago, when the pain returned. Four days before I saw her vomiting began and two days afterwards this became profuse, at first containing dark, later bright blood. For three or four days the stools had been black and she became blanched, with a rapid pulse. At my visit I found an exsanguinated, sick-looking woman, with definite tenderness in the epigastrium to the right of the median line and a rapid, thin pulse. Operation was advised at once. She entered the Carney Hospital and we found, at the pylorus, anteriorly and extending into the lesser curvature, an irregular scar an inch and a half in diameter, indurated and crater-like to palpa-

tion, evidently the source of bleeding. A posterior gastro-enterostomy, with clamps and sutures, was done as quickly as possible, as the patient was in too poor condition to warrant a pylorectomy. The wound was closed in layers.

The patient recovered steadily, with occasional vomiting, which finally subsided, and at the end of a month or so was discharged in good condition. In May she reported in good condition, with slight dyspepsia for a short time relieved by limiting her meat diet.

No. 81. Female, 39 years old, entered the Carney Hospital, Jan. 1904, with a history of gastric hemorrhage in profuse amount six and four years previously. For ten years she had had more or less severe pain in the stomach and one month ago the pain grew worse and she complained more of the distress after eating, and vomited. She had lost weight and at entrance was pale, with a mass easily felt under the left costal border, moving with respiration.

At operation, by Dr. Bottomley, the pylorus was found open, the stomach was adherent to the liver all along the lesser curvature, and about 3 inches from the pylorus below the lesser curvature were adhesions between the stomach, liver and abdominal wall, evidently the site of an old ulcer. The gall bladder was adherent to the duodenum by a broad band. To the left and below the stomach the adhesions were numerous. A posterior gastroenterostomy, with clamps and sutures, was done, a few adhesions of the mesocolon near the pylorus being found.

The patient convalesced satisfactorily and in three weeks was discharged, in good condition.

No. 82. Male, 58, entered the Carney Hospital in Feb., 1904, with history of indigestion sixteen years previously, obliging him to stop work after two years.

Since then he had had a more or less sore stomach. For two years he had had spells of feeling pretty well, but as a rule, three hours after eating, he had violent pain in the stomach, relieved by enforced vomiting. The vomitus was excessive in amount, of a slimy fluid and very acid. Examination showed sclerotic arteries, a distended stomach filling the abdomen, with a capacity of over 5 quarts. There was general ptosis as well.

At operation, by Dr. Bottomley, the pylorus was found normal but surrounded by many adhesions. The gall bladder was normal but adherent to the omentum. The adhesions were freed and a posterior gastroenterostomy, with clamps and sutures, was made.

The patient rapidly convalesced, and in three weeks was discharged, eating solid food without pain or distress and with relish.

Examination of the stomach contents before operation showed presence of hydrochloric acid.

No. 83. Female, 25, had been well up to three weeks before entrance to the Carney Hospital, when she had pain in the stomach, with vomiting. For a week she was nauseated but did not vomit, then she went to bed, with a severe epigastric pain, vomiting, and much tenderness and pressure on the abdomen. Since then there had been much sharp pain in the epigastrium, relieved somewhat on lying down. She had not eaten solids for a week, but was able to take liquids.

Examination showed an anemic girl, tender in the epigastrium, with light spasm over the pylorus. Operation showed at the pylorus numerous old adhesions to the colon and omentum, extending from an irregular scar on the anterior wall of the pylorus, both on the stomach and duodenal side. Close to the pylorus on the proximal side was a pouching of the stomach, with a slight contraction as in a beginning hour-glass stomach. The stomach was not dilated and the pylorus was open, although contracted to about half its normal diameter. The duodenum was mobilized and a gastroduodenostomy was made by Finney's method and the wound closed.

For a day or two the patient had more or less vomiting, which then ceased, and she steadily gained, eating solid food without distress, and was discharged in two weeks, in excellent condition.

No. 84. Female, 32 years old, referred by Dr. Hamblen, of Maynard.

For three years the patient had been unable to work at her business as a dressmaker. The trouble started with a so-called attack of grippe, which lasted three months and

from which she had never recovered, being in bed for several weeks at a time, off and on. She had been unable to take solid food from the first and had been troubled more or less with gas. In some of her attacks she would vomit, but after going to bed and living on liquids the trouble would stop, only to return after eating ordinary food. For over a year she had not eaten a square meal, and had lost over 20 lbs. The pain would come about half an hour after eating, was worse when lying down, and would last until she vomited, with relief at once. She had vomited retained food and in excessive amount. The distress varied somewhat and was relieved at times by the various medicines for indigestion. She had been very constipated. Examination showed a slightly distended stomach with free hydrochloric acid, and poorly digested food. The lower edge of the stomach was an inch and a half below the umbilicus.

At operation, at the Carney Hospital, the stomach was found dilated, the upper edge being about an inch above the umbilicus. From the gall bladder a broad sheet of adhesions, thickened anteriorly into a stout band, passed to the anterior wall of the stomach to the proximal side of the pylorus. In addition there were diffuse adhesions over the duodenum. Most of these adhesions were separated and ligated. The pylorus was contracted spasmodically, but admitted the tip of the finger. There were no signs of ulcer. A posterior gastroenterostomy, with clamps and sutures, was made. Posteriorly, near the pylorus, were some scar-like bands. The gastrohepatic ligament was shortened with catgut and the abdominal wound closed in layers.

The patient convalesced rapidly and was discharged in three weeks, eating solid food, and has remained perfectly well ever since.

No. 85. Female, 28 years old, referred by Dr. McGrath, of Beverly, entered the Carney Hospital in Dec., 1903.

Two years ago she had complained of gas in the stomach and intestines, with distension, relieved by eructation. These attacks came on irregularly and apparently had no reference to the food taken. At times there was nausea, but without vomiting or blood. There were pain and soreness in the epigastrium and she was badly constipated. Examination showed poorly digested food, a dilated and prolapsed stomach, with hydrochloric acid present.

At operation, by Dr. Bottomley, a sagging, dilated stomach was found, with normal pylorus. The mesocolon was adherent to the posterior wall. A gastroenterostomy, with clamps and sutures, was made and the wound closed.

Patient was discharged in about three weeks, in good condition.

No. 88. Female, 35 years old, referred by Dr. Dewis. She had had a pelvic operation of some sort eight years before. Stomach trouble began about two years ago and was marked by the inability to eat any but the simplest form of food. After eating she complained of a lump in the epigastrium with pain lasting several hours. These attacks would be severe if she attempted to eat a hearty meal. There had never been vomiting. She complained much of eructation of gas one or two hours after eating. She had not lost weight. There was no history of blood in the stools. She was always constipated and had suffered from asthma for a number of years. During the attacks of gastric trouble she would shut off all food except a small quantity of simple liquid, until she grew weak from starvation, when she would return to ordinary diet. Then at the end of two weeks or so the cycle would be repeated. Examination showed a sagging stomach, with the upper border a little above the umbilicus. Examination of the stomach contents showed complete achylia with prolapse and dilatation.

At operation, at the Carney Hospital, in May, 1904, there was found adherent to the lower abdominal scar a stretched-out prolongation of the omentum dragging the stomach downwards. This adhesion was ligated and cut. The stomach was found U-shaped and prolapsed; the lesser curvature lying one inch above the umbilicus; the pylorus, as well as the remainder of the stomach, appearing normal. The right lobe of the liver was prolapsed, with its edges nearly at the level of the umbilicus, the diaphragm being flattened and resting on the dome. A posterior gastroenterostomy, with clamps and sutures, was done, the gastrohepatic omentum shortened, lifting the edge of the stomach nearly to its normal position. The slack round ligament of the liver was sutured to the under surface of the diaphragm, supporting the liver. Abdominal wound closed in layers.

No. 68. Female, 58 years old. Transferred from the medical side of the Carney Hospital, April, 1904.

She had had stomach trouble off and on for seven years, vomiting blood, without pain, the attack coming on about every year. Three weeks before entrance she was troubled with gas, especially after eating, and distress. She had lost twenty-five pounds in the last year. She had been twice in an asylum with some mental trouble. In the epigastrium there was some tenderness on deep pressure. She had limited herself to the most simple diet for a number of years.

At operation the pylorus showed old scar tissue on the anterior wall and towards the duodenum. The opening was much narrowed and without induration. The patient was very fat and instead of doing a gastroduodenostomy it seemed safer to do a posterior gastroenterostomy in the usual way, with clamps and sutures. The wound was closed in layers. The patient did only fairly well after the operation, persisted in vomiting small amounts whenever attempts were made to feed her as the usual gastroenterostomy patients are fed. So three weeks after the first operation the abdomen was reopened and the anastomotic opening was found free, easily admitting three fingers, but at the left angle there was a small point of adhesions between the stomach and the distal loop, close to the sutured edge, pulling the gut a little forward and making a slight kink, but apparently not sufficient to close the lumen even to a slight extent. The proximal loop was not edematous nor swollen. There was no sign of its being obstructed. Measurement showed that the distance from the edge of the suture to the jejunal origin was 6 in. and as the gut lay in position there was no sign of loop or kink. The distal loop was negative. Palpation of the retroperitoneal portion of the duodenum showed no evidence of obstruction. The opening in the stomach was at the lowest level. The lumen of the pylorus was still narrow. Nothing elsewhere was found to account for the persistence in vomiting other than the small kink at the distal edge. However, entero-enterostomy was made, with clamps and sutures, and the wound closed. She made a good recovery, and in a short time was discharged in good condition, without having vomited and gaining steadily and rapidly in every way.

No. 89. Male, 55 years old, was seen with Dr. Deacon, of Milltown, N. B., in May, 1904.

Twenty years ago he had a severe attack of so-called inflammation of the bowels, since which time he had had a delicate stomach and had suffered much from dyspepsia. In the winter of 1902–3 he was ill for a long period. Cancer of the stomach was suspected from the symptoms. Hydrochloric acid was found present, and under careful treatment the patient improved and was fairly well during the summer. Relapse followed during the past winter, and an operation was advised. He had rarely vomited and only once or twice had there been any excessive amount. The abdomen had been tender in one spot in the pyloric region. He complained more of distention and gas than anything else, and at times, especially at night, the pain from this gas would be so severe that he was obliged to rest on his hands and knees. He had been very careful of his diet for years and when the pain returned he would fast until he starved. He had lost weight and for years had been badly constipated.

At operation, at the Chipman Memorial Hospital, N. B., a moderately dilated stomach was found, while at the pylorus and adherent to the posterior abdominal wall was a tumor the size of a large horse-chestnut, extending along the duodenum for over an inch and a half, so that it did not seem practicable to attempt a pylorectomy. No lymph nodes were felt in the omentum or retroperitoneal space. A posterior gastroenterostomy was made, with clamps and sutures, and the wound closed in layers. Towards the close of the operation he vomited some blood and during operation the stomach showed some digested blood within its cavity.

A few weeks later the patient was in good condition and convalescing satisfactorily.

No. 92. Male, 55 years old. Referred by Dr. Wilder, of Medfield.

For several years patient had had dyspepsia, with much gas and eructation, coming on in spells, lasting a month or more, with intervals when he would be free for a long period. The eructations came especially after drinking water. He had never vomited, but if he attempted to eat a full meal

he would have pain, nausea and marked increase in gas formation. He had never vomited blood nor noticed black stools. He was very constipated and had lately had several attacks of typical mild appendicitis. Distress from food would come quickly, with a feeling of fullness in the epigastrium, not always relieved by eructation, and even if expulsion of the gas did relieve the acute pain there would be a dull persistent ache. Recently he had lost a good deal of weight and had pain and soreness in the right hypochondrium.

Examination showed well-marked tenderness over the appendix, dilated stomach, with poorly digested food, hydrochloric acid, and slight tenderness over the pyloric region.

At operation, at the Carney Hospital, the stomach was found dilated, with a pylorus nearly closed, probably from an old ulcer, although that could not be established. There were no signs of malignant growth in any region. The gall bladder contained a calculus the size of a buckshot, but otherwise appeared healthy. A posterior gastroenterostomy, with clamps and sutures, was made, with a short jejunal loop, and the abdominal wound closed. Through a second incision the appendix, which was obliterated through three-quarters of its length, was removed. As there seemed to be no indications of trouble from the gall bladder it was left alone.

No. 93. Female, 23 years old, had had stomach trouble two years ago lasting six months, pain coming on about one hour after eating and relieved by vomiting. Gastric pain not severe when the stomach was empty. She vomited blood once or twice in this attack. Eight weeks ago there was a similar, less severe attack. Four weeks ago there was epigastric pain again with vomiting and three weeks ago she vomited fresh blood. As in the early attacks the pain was relieved by vomiting.

At operation in May at the Carney Hospital, a dilated, prolapsed stomach was found, the lesser curve being 2 in. above the umbilicus. The pylorus was slightly thickened and nodular at the upper anterior portion but the lumen was patent. Enlarged lymph nodes were felt along the greater curvature. There were some adhesions found in the duodenum extending from the region of the bile ducts, but the

gall bladder appeared normal. The duodenum was freed and a gastroduodenostomy (Finney) was done. Examination of the inner surface of the pylorus showed a small pinhead ulceration with some surrounding induration. Elsewhere the abdomen was negative. Abdominal wound closed in layers.

No. 94. Male, 29 years old, referred by Dr. Deacon, of N. B. Six years before I saw him in May, 1904, he had had indigestion with much vomiting lasting for six months. Eighteen months later he had a second attack lasting ten days, characterized by epigastric cramps and vomiting but without blood, or retained food. The vomiting persisted more or less up to a year ago. Never had been much gas from the first. In Feb., 1903, he vomited a little blood and was ill for four months. There was much vomiting three or four hours after his midday meal, consisting for the most part of bile. Since then he had had no severe attack but considerable epigastric pain, gas and more or less vomiting and he had lost weight.

Examination showed the capacity to be two pints, some residue nearly digested after five hours, and the lesser border one inch above umbilicus.

He had derived no benefit from medical treatment at various places.

At operation at the Carney Hospital a dilated, prolapsed stomach, with the lesser curvature 1 in. above the umbilicus, was found. The liver was prolapsed to the level of the umbilicus. The gall bladder was found adherent to the deep portion of the duodenum, with a broad sheet of adhesions holding it against the posterior abdominal wall. The pylorus felt indurated and nodular as from a cicatrix, but the lumen was not much contracted. Enlarged lymph nodes were felt on the greater curvature. A gastroduodenostomy (Finney) was made. At one area on the mucous lining of the pylorus there was free bleeding whenever touched by the sponge. This area lay on the thickened portion of the pyloric ring, but there was no definite ulceration. The gall bladder, which was otherwise normal, after being freed, was sutured to the edge of the liver, and the round ligament was sutured to the anterior wall to prevent further prolapse. Abdominal wound closed in layers. Discharged in good condition.

No. 87. Female, 59 years old, referred by Dr. Dewis.

Ovariotomy seven years before I saw her. For four years she had had stomach trouble with temporary relief at intervals. For a year there had been burning in the epigastrium and loss of weight. At the beginning of her dyspepsia for a space of six months all food except liquids caused distress.

Examination showed absence of hydrochloric acid, retained undigested food after eighteen hours, dilatation and prolapse.

At operation at the Carney Hospital in May, 1904, a moderately dilated stomach with the border 2 in. above the umbilicus was found. The omentum was firmly adherent by broad bands to the scar of the former operation, apparently tending to pull the stomach downwards. Pyloric opening normal. A gastroduodenostomy (Finney) was made. Examination of mucous membrane failed to show any ulcers. Gall bladder region normal. The omental adhesions were so extensive and deep that it seemed wiser not to attempt to disturb them. Abdominal wound closed in layers. Discharged in good condition.

No. 95. Female, 30 years old, referred from the medical side, Carney Hospital, in June, 1904.

Before Feb. 12, 1904, at the time of her injury the patient had never been ill a day. On that day she was crushed and trodden upon in a crowd and was unconscious for three days. The day following injury she vomited bright blood and passed blood in her stool. For two months she was confined to bed and kept on very limited diet, vomiting blood nearly every other day besides passing blood several times in her stools.

Since April she had had many hemorrhages, coming on after pain in the lower lumber region. When lying on her right side she complained of pain in the epigastrium.

While in the Hospital she vomited coffee grounds and mucus, the vomiting containing free hydrochloric acid.

In addition to her abdominal injury she had various other injuries on the head, lower extremity, etc. There was also a marked element of neurosis present.

At operation the stomach was of about normal size and without visible evidences of ulcer. The pylorus felt normal and nothing abnormal in the duodenum or elsewhere could be found.

A posterior gastroentorostomy with clamps and sutures, was made, digested blood being found in the stomach. Patient in the hospital at time of report.

In conclusion, I should like once more to emphasize the fact that these cases have been collected and written up with only one or two main objects in view, namely, to present clinical histories as they can easily be obtained by the general practitioner and to illustrate, so far as can be done briefly, the gross pathological conditions as seen at operation. The paper has been written for this Society, a large majority of the members of which are general practitioners, or at least not operating surgeons. To include the data that would appeal to the surgeon as well, would involve a much longer and a more tedious paper. Later, when the number of cases is larger, when the end results are better known, and after longer trial with the different operations, a more complete and satisfactory analysis can be made and the indications and contraindications with regard to surgical treatment can be more clearly demonstrated in the various types of lesions.

When we stop to consider that the cases reported in this paper represent those seen in one clinic, and referred by a small number of consultants, at a time when both the profession and the laity appeal to surgery as a last resort, we are justified in hazarding the belief that there must be a very large number of people in this part of the country who should at least be allowed to have surgical advice with regard to their symptoms of gastric and intestinal disorder.

But, as we have said before, how much surgery can do, and for what types of gastric and duodenal lesions it is the best treatment, time alone will tell.

DISCUSSION.

Dr. E. P. Joslin, of Boston: The accompanying chart shows the Results of Operations upon Benignant Disease of the Stomach at the Boston City Hospital and Massachusetts General Hospital, January 1, 1898 to January 1, 1904. It is taken from a paper now in course of publication by Dr. F. B. Lund and Dr. F. T. Murphy and myself. At a meeting of the Surgical Section of the Suffolk District of The Massachusetts Medical Society, held last winter, the question of operation upon benignant gastric diseases was discussed, and at its conclusion the suggestion was made that the results of these opperations at the two large hospitals be combined and published. The writers are indebted to the Chairman of the Surgical Section, Dr. F. B. Harrington, and the Secretary, Dr. E. A. Codman, who arranged the meeting, for permission to use the Massachusetts General Hospital statistics, and to the surgical staff of the Boston City Hospital for consent to record their cases. The writers further wish to express their appreciation of the kindness of Dr. Arthur T. Cabot, who read the manuscript before it was sent to the printer.

The reason for the publication of this chart at the present time is the firm conviction of the writers that gastric surgery is making such rapid progress in Boston that it is unfair to embarrass future statistics with those of the six pioneer years in this branch of surgery. Moreover, not long ago the medical aspect of ulcer of the stomach at one of these hospitals was critically studied by a physician and surgeon, and it seemed fitting that the surgical side of the question should be as impartially treated. The above paper showed that the immediate success attending medical treatment of ulcer of the stomach in Boston was far below that usually given in the literature. Fifty-five per cent. of the patients were discharged well from the hospital in contra distinction to Leube's seventy-four per cent. cured. The ultimate results were still worse and demonstrated that fifty-six per cent. of the ulcer patients were either dead or had had stomach trouble referable to the ulcer since their discharge from the hospital. It is with *patients similar to this fifty-six per cent. of medically unsuccessful cases*

that this paper deals. While the results are not as favorable as have been elsewhere reported, they represent the facts. Furthermore they show the condition of the patient some time after the operation and not the immediate result alone.

The conclusions of the paper are as follows:

1. Results of Operations in Benignant Disease of the Stomach, at the Boston City Hospital and the Massachusetts General Hospital.

JANUARY 1, 1898, to JANUARY 1, 1904.

	Number of Cases.	Deaths.	Well.	Relieved.	Not Relieved.	Secondary Operations.
Hemorrhage,	10	10	0			1
Perforation,	18	13	5			2
Chronic Ulcers,	21	5	7	4	5	8
Pyloric Obstruction,	21	5	9	3	4	2
Acute Dilatation,	1	1	0			
Total,	71	34	21	7	9	13

2. Surgical intervention in gastric hemorrhage should be considered even before it is urgent, and the surgeon should jointly with the physician watch the course of the patient. Cases of gastric hemorrhage entering the accident room should be seen, as a rule, by a physician as well as a surgeon.

Operations upon females under thirty years of age should be most conservatively advised, since death under medical treatment is rare. This generalization, however, should not unduly influence consultants in a case of repeated hemorrhages threatening life, even in a patient below this age.

3. Mortality in operations for perforation of the stomach is chiefly dependent upon the length of time intervening between perforation and operation and the virulence of infection. To lessen the mortality house officers should report suspected cases simultaneously to the physician and surgeon on duty, or their substitutes, and should obtain permission for a possible operation from the patient or friends.

4. Patients with chronic ulcers of the stomach or strictures of the pylorus should be jointly watched by the physician and surgeon. The surgeon should know the patient before being compelled to operate. Postponement of operation after it is indicated is dangerous, owing to the possibility of hemorrhage, perforation and exhaustion.

5. Errors in surgical technique occurred, which in subsequent operations will presumably be avoided. Methods of operation were chosen, which in the light of the experience of to-day would be considered unsuitable. Together these classes of cases account for about half of the deaths.

6. The seventy-one cases were operated upon by twenty-five different surgeons—an average of one case to each surgeon in twenty-five months. It is reasonable to conclude that the mortality would have been less if each surgeon had had more experience.

Dr. F. B. Lund, of Boston, stated that it was a privilege to hear such a paper as that Dr. Munro had read, upon a subject of so much importance in the medical and surgical world. It seemed to him that, in this field, the greatest and most important advances in surgery at present are being made. Our knowledge of diseases of the stomach, and our ability to help, by surgical means, patients hitherto incurable, are rapidly advancing.

In regard to the table, of which Dr. Munro had spoken, he agreed with him that this table gave a very false impression of the mortality from diseases of the stomach. These operations were the early cases of a large number of men who were acquiring their experience in this class of surgery. With the knowledge of the pathology and surgical technique which the experience of these cases has brought, a greatly diminished mortality is to be expected in the future. It is easy, in reading the history of these cases, to detect errors in the interpretation of conditions, and in the technique of operations performed.

It has been pretty generally conceded by a large number of operators of experience, that the posterior gastroenterostomy, as performed by Moynihan, and Finney's operation of pyloroplasty, are the methods which give the greatest relief with the lowest mortality in these cases.

The question of choice of methods to be used in individual cases is a broad one. The speaker's experience, and his study of the cases entering into this table, have led him to the general conclusion that, in cases where the pylorus is completely occluded by scar tissue, and is likely, therefore, to remain occluded, posterior gastroenterostomy is the op-

eration of choice. In cases where the obstruction of the pylorus is due to spasm from the presence of chronic ulcer, perhaps at some distance from the pylorus, cases in which, with a gastroenterostomy, the pylorus would be likely to expand, allowing the gastroenterostomy to contract, until a condition of things results from which the stomach gets proper drainage neither way, Finney's operation is perhaps indicated. However, the question of the best operation for various conditions is still *sub judice*. The question of the excision of the pyloric, or ulcer-bearing area of the stomach, for ulcer of the stomach, is one that is interesting the surgical world to-day.

Dr. Lund then spoke of three cases of subacute perforation of the stomach. These occasions were signalized by epigastric pain, tenderness and spasm, soon subsiding, and not going on to general peritonitis, thus in contradistinction of perforation into the general peritoneal cavity. In these cases posterior gastroenterostomy has been done without separating the adhesions which walled off the perforating ulcer or peritoneal cavity. By this procedure one avoids the difficult process of infolding a thickened and inflamed area of the stomach wall. Infection is avoided. The freest kind of drainage is provided, and the after history of these cases demonstrated that the ulcers healed rapidly under the internal drainage provided by the gastroenterostomy, and the adhesions under the same conditions did not do any harm.

This technique, in the speaker's opinion, for every reason should be greatly preferred to the separation of the adhesions, thus opening up the ulcer, and infolding, by suture of the perforations.

Dr. H. F. Hewes, of Boston: There can be no doubt that in the advance in Gastric Surgery, Medicine has become possessed of a new and very practical therapeutic measure for use in a very common branch of disorders, the diseases of the stomach. I am perfectly aware when I say this that the results in regard to gastric surgery are not yet all in. Most of our reports upon the subject are from surgeons who are apt to think more of the immediate result of the operation than of the ultimate result. Also time has not yet elapsed sufficient to test the mass of gastroenterostomies which have been reported in preliminary records.

Enough however has been proven to convince the medical mind that in gastric surgery we have a useful and fairly safe therapeutic method with a great future.

When and where to use this method is of course always a matter of judgment for the individual cases, but that it has a use, and that such possible use must be borne in mind by the physician in the consideration of each and every one of his cases of stomach disorder, is a fact which to-day admits of no doubt. When we consider the actual use of this new therapeutic method up to the present, we cannot but conclude, I think, in reviewing the field of fact and opinion, that the tendency is, for the physician, where the judgment rests with him, to use it too little or too late, for the surgeon under the same circumstances to use it too often and too soon. This of course is meant as a very general statement. There are many men in both ranks who are at one on the subject. This variation between the two branches is due in fact, I think, to the difference in the experience of the two. The physician sees many more stomach cases than the surgeon— the mild and severe — and a great majority, 90% or so, get well under medical care. He looks upon a laparotomy as a dangerous operation, and rightly to a certain extent, and he prefers to take the chance of his case being among the 90%, unless the evidence is very strong against it.

The surgeon, on the other hand, sees as a rule only the serious cases, the 10% of uncured cases ; he has not quite the same fear of a major operation as the physician, and he is for operation in a given case of doubtful character according to this experience. As a matter of fact, however, the fault with both physician and surgeon lies principally not in the difference of training or experience, but in an insufficient consideration in regard to diagnosis in the routine of cases which come to them.

If a full appreciation of the possibilities of diagnosis by the use of thorough methods, and a habit of applying these methods in all cases existed generally, a considerable number of cases which are now kept too long under medical care would come to the surgeon at an earlier date, and many cases with no indication for operation, save a doubt as to diagnosis due to ignorance of conditions present, would be spared unnecessary operation.

There is at some hands a tendency to decry expert diag-

nosis in stomach conditions, owing to the fact that the old rules promulgated before all facts were in, in regard to the association of absence of HCl. with carcinoma, have proved not to be infallible. The facts of the chemistry of the gastric contents make but a small part of the results of expert examination, and in connection with surgery, as a rule, a secondary part of very secondary importance. The facts which have the most bearing upon surgery of the stomach are those in connection with the motility of the organ, its size and the condition of its orifices. And these facts can always be determined by applying proper methods of diagnosis, and they should always be determined in every stomach case, however mild or however severe its type.

The findings may not always affect the question of operation in a given case, but they will frequently do so, and at all events we are in a better position in regard to treatment medical or surgical, the more facts we have have in. The number of cases treated medically in ignorance of the real conditions present would alone serve as an excuse for impressing this fact upon the physician, without the additional argument offered by the cases of carcinoma or ulcer which come too late to surgery. And the number of cases which I have myself seen operated upon without previous thorough investigation, where operation showed no condition present for which operation was indicated, serve as an excuse for impressing it upon the surgeon.

Dr. C. L. Scudder, of Boston: It is a principle with which we all agree, that any surgical procedure must be done with precision and with speed and be adapted to the case in hand, in order that it may prove efficient. There is no procedure in surgery which demands such accuracy of technique as does the operation of gastroenterostomy. Faulty technique may mean death of the patient.

I have been very much interested in the various operations upon the stomach which have been developing during the past few years. I have been interested in these operations from a physiological as well as from a purely surgical point of view. In a recent visit to the clinics of several surgeons in England and upon the Continent, for the purpose of learning the technique in use there in gastric surgery, I was very much impressed by the simplicity of most methods,

but especially by the fact that, save in one clinic, the routine procedure in gastroenterostomy is the posterior operation. As my contribution to this discussion of Dr. Munro's extremely interesting paper, I will describe and illustrate by means of lantern slides the various steps in the technique of a posterior gastroenterostomy.

Dr. Scudder showed some lantern slides illustrating the various steps in the operation of a posterior gastrojejunostomy, emphasizing the important details as the slides were shown.

ARTICLE XLIV.

IMPLANTATION OF SILVER FILIGREE FOR CURE OF LARGE VENTRAL HERNIA.

By HERBERT B. PERRY, M.D.
OF NORTHAMPTON.

READ JUNE 7, 1904.

IMPLANTATION OF SILVER FILIGREE FOR CURE OF LARGE VENTRAL HERNIA.

REPORT OF TWO CASES.

THERE is no operation of reconstruction that the surgeon is called upon to perform that taxes more the resources at hand or promises less as far as restoration of function is concerned than large, ventral hernia of long standing, whether post-operative, congenital or acquired.

The principle involved in the two cases I have the honor to detail to this Society is an old one, although the technique is of a later period than when silver wire was first used as a buried suture.

In the evolution of suture materials silver wire has always been in evidence. Shede was the first to use it as a buried suture. His method was to include all the structures except the skin, as a preventive of subsequent hernia. A large impetus was given the silver wire suture when Credé published his discovery of the antiseptic properties of silver. In this country A. M. Phelps, of New York, was one of the first to use silver wire sutures in closing abdominal wounds, as well as its use in radical cure of hernia. The plan followed by him was to use a single strand, crossing and recrossing, to insure strength and solidity. The cases done by him were not, in the main, successful, owing, no doubt, partly to faulty asepsis, partly to

the impossibility of using a single strand of wire without more or less strangulation of the tissues and, consequently, tissue necrosis. His use of silver wire began in 1892. From this time until 1900, when O. Witzel, of Bonn, published a report of a series of cases of hernia, giving results of the use of buried silver wire, very little progress was made, and the advance made since then is largely due to improved asepsis.

Witzel's plan was to form a weave or net-work over the hernial opening with a single strand of wire.

About the same time that Witzel reported his cases, R. Gopel, of Leipsic, reported a series of cases wherein a previously prepared silver filigree pad was sewed over the opening in the abdominal wall. This was the first account of the implantation of a silver filigree pad being used to cure large, ventral hernia. His deductions from his cases and claims of superiority for this particular method over that of Witzel's were as follows:

First. The tissues bordering the hernial opening are less exposed to injury and constriction.

Second. The time for operation is reduced.

Third. The meshes with the ready-made wire pad are of equal and regular dimensions, and diastasis, even of small size, less frequently met with.

Fourth. The amount of silver wire left is reduced to a minimum.

In November, 1902, Dr. Willy Myer, of New York, reported, in the Annals of Surgery, three cases. In two of his cases previous attempts at repair had been made and were failures. The third case, owing to a large amount of adipose, seemed hopeless, except some means out of the usual line were attempted. His reports of the three cases were eminently satisfactory. The technique, as described by him, is the one employed in the cases to be reported.

It will not be necessary for me to consume time by giv-

ing in detail all of the steps of the operation, but to say that it is identical as though an autoplastic repair were to be done, up to the point of closing the hernial opening. From that time the plan of procedure is as follows:

The omentum should, if possible, be stitched to the margin of the hernial ring. The sac is cut away, except that sufficient is left to close over without much tension. This is done with a continuous silk suture. The fat is then excavated sufficiently wide to admit the silver wire pad and permit stitching its border to the muscles and fascia. This is done with a continuous silver wire suture of sufficient length to have its starting and finishing points together, thus reducing the rough points left to the minimum. This completed, the skin and fat is closed over all by interrupted silk-worm gut sutures. The silver pad should be of sufficient size to overlap the margins of the opening from one-half to one inch.

This plan is permissible only and indicated only in the classes of cases where autoplastic repair is impossible with any assurance of success, for any or all of the following reasons:

First, the large size of the hernial opening; second, long existing hernia; third, atrophy through pressure and fatty degeneration of the adjacent muscular and fibrous tissues; fourth, and most frequently, previous unsuccessful attempts at autoplastic repair; and fifth, in fatty abdominal walls.

The following cases are illustrative of two distinct types, the first a post-operative hernia having had an attempt at repair, the second an acquired umbilical hernia of many years' standing.

Case 1.—Mrs. A., age fifty-two, occupation housekeeper in a factory boarding house. In 1890 this woman was operated upon and a large ovarian cyst removed. A year later, as a consequence of vomiting violently after ether to reduce a Colles' fracture, a hernia in the ventral

scar developed. A year after that an operation for the cure of the hernia was done, which was unsuccessful, inasmuch as in six months the hernia returned as bad as before. This woman felt after the first trial that a cure was impossible and began a truss and abdominal band existence. In 1896 matters grew worse, and until 1903 she had been a constant sufferer and from 1900 she had never had a day free from pain, many times requiring large doses of morphine to be comfortable. In January, 1903, she was a woman five feet two inches in height, weighed one hundred and ninety pounds, with a fat, pendulous abdomen. The hernia was very large, containing intestine and omentum, and was not reducible. On January 16, 1903, she was operated upon and a silver filigree pad four by six inches was stitched snugly to the muscles and fascia, around an opening two inches and a half wide and four inches in its longest dimension. In this case we could not utilize the omentum by fastening it to the margin of the hernial ring, because at this and at previous operations it had been very largely removed. The skin was sutured over the pad by interrupted silk-worm gut. In ten days the wound had healed entirely, she was allowed out of bed in three weeks and went home in four.

Case 2.—Mrs. B., age forty-three, occupation housewife, had had a hernia for a long time, could not remember when it began, but for the last six years it had given constantly increasing discomfort and pain until the 1st of March, 1903, life had become unbearable and the patient sought and accepted anything that offered any chance of relief. This case was first seen the 12th of March, 1903. She was then a woman five feet in height and weighed about two hundred pounds, with a large deposit of adipose over the abdomen. The hernia was a little to the left of the umbilicus and contained mostly omentum and was not reducible. Her operation was done March 20, 1903. The hernial opening was two by two and a half inches, the largest diameter in the direction of the long axis of the body. In this case the omentum was stitched to the margins of the openings with a continuous silk suture and a silver filigree wire pad three inches by four inches stitched to the muscles and fascia with a continuous silver wire

suture. The skin was closed by interrupted silk-worm gut with the usual dressings. This patient was out of bed in three weeks and was allowed home in four.

In each case were indications for this operation, namely, each of long standing, with atrophy and thinning of the muscles and fascia, large hernial openings, and, in Case 1, previous attempts at repair.

These cases have been seen recently and are well. Case 1, eighteen months after operation, is, with the assistance of a green Polish girl, caring for a large family. Case 2, fifteen months after operation, is doing the housework for herself and husband with comfort, which she had been unable to do for several years before. A close examination of each case shows a firm, solid abdominal wall without suggestion of diastasis. These women claim to experience no discomfort or consciousness of a foreign body in the abdominal wall and are both enjoying life thoroughly. The question naturally arises, will they ever experience any trouble, and if so, why, after more than a year of freedom? The operation is not difficult, and, with strict asepsis, should be successful.

I venture to suggest this operation as a remedial agent worthy of trial in that class of cases where tissues already existing in the patient cannot be utilized to cure the defect.

ARTICLE XLV.

MALPOSITIONS OF THE UTERUS, THEIR CAUSES AND TREATMENT.

By DANIEL J. BROWN, M.D.
OF SPRINGFIELD.

READ JUNE 7, 1904.

MALPOSITIONS OF THE UTERUS, THEIR CAUSES AND TREATMENT.

When we speak of a normal uterus, in the general acceptance of the term, we mean that the fundus should be on a level with the plane of the superior strait, and the os externum should touch a line drawn from the lower surface of the symphysis pubis to the lower margin of the fourth sacral vertebra. This would bring the axis of the uterus very nearly at right angles to the vagina. However, some works on anatomy represent the uterus as having a straight canal, viz: its axis corresponding to the long axis of the body. Dependent upon respiration, intra-abdominal pressure, body movements, and the bladder or rectum distended or empty, the uterus changes its position very frequently. This is called the normal range of movements and is controlled by the uterine ligaments, the functions of which are as follows: The round ligaments resist backward displacement of the body; the utero-sacral and vesico-uterine resist the downward pressure or prolapse. The broad ligaments, besides preventing excessive lateral motion, enter largely into the support of the uterus — they are the weight carriers and have a fixed capacity. When the pelvic fascia is anywhere injured, every other portion of the pelvic contents feels the effect of the relalation. If the uterus is subinvoluted and heavy with blood, the broad ligaments feel the increased weight and they are no longer able to resist the force of gravity; therefore, the uterus remains in its normal position by the concerted action of its several ligaments and the

pelvic fascia, which are mutually interdependent for their integrity of action. That the perineum is responsible for the support of the uterus and vagina, I believe has but very few adherents at the present time.

In citing the causes of retro-deviation I shall make use of Krusen's classification.

Class A.

VIRGINAL RETRO-DEVIATION.

1st.—Congenital retroflexion was first recognized by Saxtorph in 1775, next by T. L. Lee in 1849, is usually due to the incomplete development of the anterior and posterior uterine walls.

2d.—Schultze attributes puerile retroflexion to congenital shortness of the anterior wall, whence it follows that distension of the bladder, which normally would slightly displace the uterus, completely retroverts it.

3d.—Senile atrophy of the genitals, which is associated with shortness of the vagina, while the bladder capacity remains unchanged.

4th.—Every time the bladder becomes filled, the uterus, as already stated, is placed physiologically in a temporary position of retroversion; hence prolonged over-distension predisposes to this form of displacement.

5th.—Habitual constipation resulting in severe straining efforts and increased abdominal pressure during difficult evacuation of the rectum, is a frequent factor both in virgins and parous women.

6th.—Masturbation by relaxing the uterus and the loss of nutritive fluids, is according to Fritsch, responsible for many cases of virginal retrodisplacement. Hildebrandt found seven such cases in twelve girls addicted to the vice.

7th.—Constitutional diseases, such as chlorosis and anemia, tend to relax the uterine supports, cause a disappearance of the adipose tissue, produce constipation and even make the uterine muscle itself relaxed and flexible.

Class B.

PAROUS WOMEN.

1st.—Puerperal metritis, or subinvolution—this may be confined to the placental site or affect all parts of the uterine walls. If the placental site be on the anterior wall and the area be inflamed and thickened, this will produce a marked tendency to retroflexion. Chronic or puerperal metritis, by increasing the size and weight of the organ, with corresponding relaxation of the broad and round ligaments, will favor malposition.

2d.—Larceration or over-stretching of the pelvic fascia, permitting the development of a rectocele and cystocele, is followed by downward or backward displacement.

3d.—Salpingitis, by producing adhesions between the adnexa and the pelvic walls.

4th.—Pregnancy may also be a factor, or may be complicated by it.

5th.—Pressure from corsets, heavy skirts suspended from the waist, tight clothing, and prolonged pressure from a tight obstetric binder.

6th.—Traumatism, blows, falls, or violent muscular effort.

7th.—Neoplasms, either intra- or extra-uterine, may by their pressure displace the uterus.

8th.—Among the more infrequent and problematical causes may be mentioned impotent husbands, as suggested by Hildebrandt, although Winckel states it is probably a simple coincidence.

9th.—A wandering spleen was the direct cause in one instance reported.

Chronic cystitis, which shortens the vesico-vaginal septum by contraction, may produce a retro-displacement. This form is incurable. (E. C. Dudley.)

Anteflexion is an accompaniment of non-development of the uterus, which manifests itself by severe obstructive

dysmenorrhea in girls at the beginning of menstruation, and is a cause later in life of sterility. Among other causes may be mentioned over-indulgence in dancing, gymnasium work, wheel riding, sewing machine running. Severe work of any kind about the age of puberty, may act as a derivative to the important menstrual organs, and one or more of them may be left undeveloped. Schultze has described a condition of immobile retroflexion resulting from posterior parametritis. W. L. Burrage has given the subject considerable thought and study and has published two interesting papers. He concludes that the chief cause of the condition is a shortening of the utero-sacral ligaments, which shortening renders it impossible permanently to remove the flexure. Immobile retroposition with anteflexion is seen following labor and abortion from posterior adhesions, from tubo-ovaritis and hematocele. Generally one or both ovaries are found prolapsed or enlarged. Endometritis is almost invariably present. The condition is attended by dysmenorrhea, scanty menstruation or profuse flowing, pelvic pains, frequent abortions or sterility in the married, chronic irritation, bladder irritability, and leucorrhea.

Where there is laxity of the uterine supports, the round, broad and utero-sacral ligaments, associated with softness, fatty degeneration and want of tone of the uterine tissue, we have a pathological condition first mentioned by Pozzi in 1896, and afterwards described by Edebohls, known as excessive mobility of the uterus. The laxity of the ligamentous support is the essential condition. Add to this softness of the uterine tissue, and you explain the cause of flexions. If such a patient be examined by a number of men, the uterus will be found in different positions at each examination. I well remember such an occurrence. Each examiner made out a different position, consequently each thought the other had erred. According to Edebohls, a diagnosis of excessive mobility of the uterus is made in the

following manner: "Say we find the uterus, on bimanual examination, in anteversion or anteflexion, — push the cervix toward the symphysis by the intra-vaginal finger carried into the posterior fornix of the vagina, at the same time crowding the body of the uterus backward into retroversion by the fingers of the other hand upon the abdomen. An excessively movable uterus is thus readily retroverted, and moreover remains in retroversion after withdrawal of the fingers from the vagina and abdomen, or returns but very slowly and sluggishly into a position approximating the normal." In this it differs from the uterus with normal mobility, which either would be replaced into retroversion of the second degree, or if forced into the latter position, immediately springs back into normal anteversion when released from the pressure of the fingers.

Symptoms.—Besides the usual symptoms, we have disturbance of the lower part of the intestinal tract, namely, tympanites and readily provoked irritation of the colon and rectum, as manifested by alternate constipation and looseness of the bowels, occasionally membranous enteritis, neuralgiæ and dysæphesiæ of a fugitive or wandering character, generally not severe, affecting the lower end of the trunk. This condition may be present in Glénard's disease. The symptoms of this condition are explained by irritation of the hypogastric plexus of the sympathetic.

A study of the treatment of malpositions of the uterus is unsatisfactory. A few years ago, when corrections of uterine displacements became the surgical craze, one operative method after another was brought forth until at the present time the number is legion. Some of them are as unsurgical as others are surgical. How shall we best treat these conditions? The treatment of uterine displacements must have two distinct purposes in view: first, the bringing forward of the uterus to its normal position; second, its retention therein. The vexed question is how to retain

it there. Taking into consideration the wide range of mobility exercised by the normal uterus, a careful non-surgical and medical treatment should be first thoughtfully considered, being guided by the general condition of the patient, the symptoms complained of, duration of the displacement, and the complications, if any; also what changes the surrounding structures may have undergone.

The non-surgical treatment of uncomplicated retroversion is as follows: Carefully replace the uterus by bimanual manipulation from vagina and abdomen. If the vaginal manipulation fails, transfer the fingers to the rectum. If you are still unable to reduce it, try the knee-chest position. If all these measures fail, an anesthetic should be administered. This completely relaxes the patient, and there will be no trouble in the reduction of the organ. If the displacement has been of short duration, a well-fitting pessary may be used immediately after reposition; on the other hand, if the displacement has been of long duration, the daily use of sterile tampons saturated with either ichthyol or glycerine and packed firmly against the cervix would be advisable, until all tenderness has disappeared. A Hodge-Smith pessary of proper shape and well fitted may then be used. This pessary will temporarily support the uterus in its normal position, besides relieving the abnormal strain. It gives the over-stretched sacro-uterine and round ligaments, which contain muscular fibres, as well as the vaginal walls, a chance to regain their normal tone and also the lower bowel, which becomes atonic from constant pressure. As we learn to differentiate our cases more carefully, the prejudice which exists against the use of the pessary will promptly subside.

Besides this treatment, the patient should be given general tonics, especially those which have a tendency to tone muscles, also hot vaginal douches containing alum, at a temperature of 115°, twice daily, the patient lying in the

recumbent position. She should also be advised to assume the knee chest position three or four times daily, two minutes each time, and with finger retract the fourchette, thus allowing air to enter the vagina which distends the vaginal vault and counteracts intra-abdominal pressure. The patient should also be urged to lie upon the abdomen while sleeping. This treatment should be carried out during a period of at least two or three months. In a certain percentage of cases such efforts will be rewarded by good results. This may not meet the opinion of some whose teaching is always operative, but results often give us decided opinions of our own.

When, however, the retractile power of the utero-sacral ligaments is completely lost, the following simple operation, devised by A. H. Goelet, is to the writer a step in the right direction. In 1899 Dudley, in a paper before the Chicago Gynæcological Society, said "We are now prepared to announce the great general principle of mechanical support as follows: If the cervix be normally placed within an inch of the hollow of the sacrum, the body of the uterus will, in the absence of complications, usually take care of itself." The operation about to be described aims at overcoming the displacement by holding the cervix permanently backward in the hollow of the sacrum and doing away with the necessity for a pessary, making use of the posterior vaginal wall for the attachment of the cervix, which, under normal conditions, is firmly connected with the anterior wall of the rectum.

Technique.—Patient is placed on the back in the exaggerated lithotomy position, vagina and vulva are cleansed in the usual manner by scrubbing, then the surface of the vagina and cervix are dried and painted with tincture of iodine to stain it and render it aseptic, or a solution of methylene blue may be used for this purpose. An area about one-half inch square upon the posterior surface of the

cervix is denuded of its mucous membrane and a similar surface upon the posterior vaginal wall, well up in the sulcus behind the cervix, is likewise denuded. These denuded surfaces are then approximated by deep sutures, three or four of which will suffice. Material, catgut or silk worm gut. A tampon of gauze is placed against the cervix to take the strain off the sutures and keep the surface of the vagina dry. Dressings are removed on the second day and may be renewed or not, as the judgment of the surgeon may dictate. Patient is kept in bed one week and encouraged to rest on either side rather than upon the back. If silk worm gut is used, it may be removed in two or three weeks.

The Alexander is a popular operation in uncomplicated cases of retro-deviation. Its advocates claim that the round ligaments will hold the uterus long enough in position to allow the utero-sacral ligaments to regain their normal tone. Many objections are urged against it, with all of which you are familiar. In two instances where the writer has performed the Alexander, a diseased appendix was also removed through the right incision, which was small, and carried through to the abdominal cavity. Both made excellent recoveries and no hernia followed.

In anteflexion due to muscular non-development, Martin advocates the use of electricity and has had exceedingly good results. He also recommends large and stimulating hot douches night and morning, supplementing these douches by an antiseptic douche immediately before treatment. The length of time required to carry any case to a successful termination is from three to six months. This might be urged as a serious objection. He also advocates proper exercise, general tonics, and laxatives if necessary.

In choosing operative procedures in cases of ante-flexion, we have Dudley's operation, which consists in a division of the posterior wall, past the utero-vaginal attachment nearly

to the utero-peritoneal fold in the pouch of Douglas; or, a modification of the same now in vogue at the Free Hospital for Women, a description of which appeared in its Bulletin, January, 1904. The success obtained has been remarkable and is worthy your consideration. Simply to dilate and curette, in this form of displacement, as is generally done, and expect good results, is a practically useless procedure. In extreme cases the anterior lip may also need attention.

In immobile retroposition with anteflexion, Burrage advocates, besides curretting, a division of the utero-sacral ligaments through an abdominal wound, and suspension of the uterus.

Where we have retro-deviation plus adhesions, it may be corrected in the following manner: Make a traverse incision through the posterior fornix, break up the adhesions, carry the uterus forward, then pack gauze into Douglas' pouch and also beneath the cervix, pressing it well upward and backward. The adhesions thus formed will lead to a correction of the displacement.

The treatment of excessive mobility of the uterus is essentially the same as that for movable retroversion of the uterus. A pessary will effect a cure in a percentage of these cases. Edebohls advocates Alexander. The writer would suggest cervico-vaginal fixation to those who object to wearing a pessary.

In retro-displacement it sometimes happens that one or both ovaries may be prolapsed. This condition very frequently is the cause of more disturbance than the malposition of the uterus itself. When the prolapse in question is due to a lax and elongated ovarian ligament, simply to correct the malposition will not relieve the patient. The ovaries must also receive your attention. Two methods of treatment are advocated: first, by taking up the slack or making a fold in the ligament and stitching it with either

silk or catgut; second, as advocated by Dudley, stitching the ovary to the posterior surface of the broad ligament. In the absence of severe complications, this may be done through the vaginal route, when it is also possible to shorten the round ligaments, or simply correct the ovarian prolapse and do the posterior cervico-vaginal fixation. Of course, where the complications are extensive, viz: deep infection involving intestines, appendix, etc., the suprapubic route would offer better facilities.

The writer's work through the vaginal route, which includes a number of cases of resection of the ovaries, tubes, shortening of round ligaments and hysterectomies, has been very gratifying. It was really a stepping stone to thorough study of plastic work.

Presumably it may be said that the nearest approach to an ideal operation in uncomplicated retro-displacements, is the one which takes up the slacks of the utero-sacral and round ligaments.

We now come to the consideration of complete prolapse. We have the following factors to consider: Backward-displacement, including relaxation of the utero-sacral muscles; a sub-involuted uterus, probably a ductile cervix, and a relaxed vaginal outlet, or a complete tear. We therefore have certain fundamental facts that must be considered: First, the whole vaginal walls are inverted. There can be no uterine procidentia without a corresponding vaginal inversion, unless it occur as a part of Glénard's disease; then the vagina may be inverted by the sagging downward of a long ductile cervix; third, the anatomical relations of fascial structures; fourth, the intact levatores ani are the most important factor in preventing this form of displacement. The indications in this form of displacement are clearly as follows: First, to cause involution of the uterus, thus rendering it lighter and capable of support by the pelvic fascia in the broad ligaments and elsewhere. To renew

also the tension of the pelvic fascia throughout the pelvis, that proper support may be given to the levatores and the connective tissue and its vessels and the rectum and bladder. When this is thoroughly done, we shall be able to discard various auxiliary operative procedures such as the Alexander ventro-fixation and others, and stand squarely by the results of our plastic work on the pelvic floor.

Previous to any surgical procedures, Emmet advocates preparatory treatment. After replacing the uterus and pushing it up as far as may be in the pelvis, the patient is placed in bed, the foot of which is raised from twelve to eighteen inches from the floor. The object of this treatment is to cause contraction of all the pelvic veins with a resulting involution of the uterus and vagina. This treatment must, however, be carried out for some time, which will be urged as a serious objection, as many poor patients cannot afford the loss of time. Munde's custom was to amputate the cervix high up and leave a granulating wound at the fornix, which, by its contraction, was to hold the cervical stump backward, when the fundus must fall forward.

If the cervix is repaired two objects must be attained: first, the complete removal not only of all scarred tissue, but equally important, of all diseased tissue; second, the excision must be carried down to the plane level with the bottom of the tear where it touches the canal. You may choose between Emmet's and Reynolds's anterior colporrhaphy. In doing the posterior operation the writer would advise carrying the denudation the whole length of the vaginal wall. I have succeeded in obtaining splendid results in five cases operated upon according to the above described methods.

To maintain a prolapsed uterus in a normal position by means of a series of plastic operations is by no means an easy task; still, there is less danger to the patient than in doing either a ventro-fixation or a suspension. The writer

has abandoned the operation for ventro-fixation for the following reasons: It is unscientific, as it places the uterus in an arbitrary position—the uterus is made to support rather than to be supported. It is a barrier to normal gestation. The circulation is more or less disturbed, as the vessels are put on the stretch and vesical irritation is sometimes caused by dragging the uterus beyond a certain level, which is certainly done in this operation. Again, no operator can predict in advance how large or how small the resulting adhesions may become. Just here is the element of uncertainty and danger. If small, they will probably stretch into a suspensory ligament; if dense and large, you may expect trouble.

The writer is opposed to creating artificial supports. Nature has furnished enough if proper use is made of them. After the menopause there may be no such objections as to making a fixed uterus support relaxed tissues, for then it is a functionless organ.

Soon after Dr. Gilliam published his operation known as Round Ligament Ventro-Suspension for Retro-Deviations, the writer performed it in a number of cases. From a physiological standpoint, it would seem that a suspended rather than a fixed uterus would better meet the demands of gestation. Unfortunately the writer has not had an opportunity to study the effect of gestation upon ligaments so treated. Like fixation, there are serious objections to it,—the great possibility of intestinal strangulation and obstruction. Again, the uterus is in an arbitrary position, one set of supports doing the work of all. How long ligaments treated thus will act as a sustaining power, is a question the writer is not prepared to answer.

In failures, after a series of plastic operations, the intra-pelvic method advocated by Mr. Henry T. Byford, for prolapse and procidentia, is worthy of consideration as it makes use of every available support.

When a hysterectomy is decided upon the vaginal route is preferable, uniting the anterior and posterior peritoneal margins, and then an end to end approximation of the stumps of the broad ligaments ought to form such a perfect support that there will be no danger of any future hernia.

In conclusion permit me to say that whichever method you may choose, it will depend upon the degree of skill with which the work is executed, whether the outcome will be success or failure.

DISCUSSION.

Dr. J. C. Irish, of Lowell: I beg to differ somewhat radically from the reader in regard to the treatment of retrodisplacement and prolapse of the uterus by ventral-suspension. I am very much at a loss to understand why it has become so much the fashion to criticise or condemn this operation, or why, when we have at our hands so simple and so effective a means of correcting retroversion and prolapse, so many other more difficult and uncertain procedures should be resorted to.

The four principal criticisms of the after results of the operation are: First, that there is danger of obstruction of the bowels by being caught in the resulting ligament; second, dystocia of labor; third, that the uterus is still left in an abnormal position; fourth, that it is an unsurgical procedure.

I have had a long experience with this operation, going over a good many years, and including more than one hundred and fifty cases. In no instance in my own practice has obstruction of the bowels occurred from ventral-suspension, nor indeed have I ever heard of a case. This danger, I am certain, is very much more imaginary than real. In regard to the dystocia of pregnancy, a few years ago Dr. Noble, of Philadelphia, investigated over eight hundred cases of ventral-suspension in reference to this point. The only dystocia of pregnancy or labor that he established was the following:

In some cases as the pregnant uterus enlarged, there was a thickening of the anterior muscular structure of the uterine

body and neck, which encroached upon the entrance to the pelvis and interfered with the engagement of the head. The os uteri was also carried backward towards the sacrum.

This single dystocia in labor, due to suspension of the uterus (and this is the only one that is shown), I believe to be entirely avoidable. I am very certain that this faulty development of the pregnant uterus has resulted from the introduction of the sutures on the posterior uterine surface. It is very evident that such forced right-angled attachment to the abdominal wall might interfere with uterine development. By placing the ligatures on the upper anterior surface of the uterus this whole difficulty would be prevented. If my conclusions are correct, the operation should be absolved from the charge of producing this dystocia of labor. It may be true that the uterus after suspension is not left in an exactly normal position, but it is near enough normal so that it ceases to give any trouble to its possessor, and the patient with the suspended uterus is exactly as well satisfied with it as though the position were perfect. At any rate, the patients consider themselves perfectly cured.

This is characterized as an unsurgical operation, but it seems to me that an operation which is so entirely simple, so easy to do, free from danger, and which perfectly corrects the disability for which it is done, is really a very surgical one. Finally, from the result of my own experience and that of my confreres who do ventral-suspension, I believe that no other surgical procedure should be considered in the treatment of uterine retro-displacement or prolapse.

Dr. J. G. Blake, of Boston, said that he had not seen any unsatisfactory results follow the operation of suspension of the uterus. If danger of strangulation of intestine arose from the adhesions between the fundus and the abdominal wall, this danger is just as great before as after the menopause; yet many writers say that the operation is indicated after the child bearing period, but not earlier. There are definite indications for suspension, in retro-displacements and moderate degrees of prolapse. In all the cases he has seen, either in hospital or private practice, no trouble has arisen following the operation, and in almost every case partial or complete cure has resulted. The actual cases of strangulation reported as a sequel are extremely few.

ARTICLE XLVI.

TREATMENT OF LATERAL CURVATURE.

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TREATMENT OF LATERAL CURVATURE.

A CLASS of curvatures of this kind which come under the surgeon's careful consideration are those characterized by structural changes in the spinal column. Those without such structural changes are amenable to simple measures. The structural changes, leaving out those due to the effect of ostitis, are changes in the elasticity and length of the intervertebral ligaments and spinal muscles, and in the shape and relative positions of the vertebræ and the intervertebral cartilages, and also with the ribs connected with these vertebræ.

Considering the importance of the subject and the value of an erect figure to the working man or woman, the dangers of distortion children are exposed to at school and elsewhere, the possibility of prevention, and the need of careful supervision for years by the family physician, it might be considered strange that the subject had excited so little interest among general practitioners. The subject has not usually been presented, however, in a practical form to the general profession, nor has the importance nor interest of the subject been sufficiently urged.

Viewed as a question of what might be termed as physical mechanics, there is no problem which can surpass that presented by scoliosis in interest, and few affections yield to treatment more satisfactorily, if taken in time and if the treatment is properly directed. There has, however, been

a lack of simplicity in the writings on the subject and the general practitioner has been led to regard the affection as not presenting problems of immediate urgency and belonging to the specialist rather than to the family medical advisor. The truth, however, is that in certain cases the affection is one for the general practitioner, and in all stages and cases it is pre-eminently necessary for the family advisor and the specialist to act in harmony.

The object of this paper is to present the simple principles and methods of treatment for this class of affections which can be adopted by the profession without demanding the elaborate preparation or outlay not feasible for any but the specialist. It is presumed in this paper that no description of scoliosis or its nature is needed and attention will be directly turned to the subject of treatment.

The principles of treatment for the non-inflammatory spinal curves of children are similar to what is practised in the preparatory training of young acrobats, and to those practised by dentists in correcting deformities of the jaw. The spinal column being curved and stiff in certain portions, needs to be made more flexible and straightened in those parts. If a distortion has developed or is developing, it must be overcome by adequate pressure applied as constantly as is practicable, and the patient during the years of susceptibility should be shielded from such influences as will interfere with treatment or favor a relapse.

The methods to be employed in the treatment of scoliosis will vary in the rigor of application according to the severity and urgency of the case. While the curvature is not considered as a disease, but as a deformity, the corrective measures for straightening the spine consist of, first, a constantly applied stretching force, and second, an intermittent application of such force. As the latter is to be used with greater strength than the former, it may be employed as a daily exercise for a short period and the former may be em-

ployed constantly or not, according to the amount of correction which is attempted. The simplest method of the application of a constant force is that recommended by the early practitioners, when a child was strapped to a board and made to sit or lie straight. This, though practical, lacked precision in its application to the portions of the spine to be straightened, but the same principles may be employed with greater directness, both in the vertical and horizontal position; the value of the latter position being that it is less fatiguing and can be applied with the most thorough removal of the weight of the head and upper portions of the trunk, which act as a force to determine the deformity.

It is necessary that the stretching exercises employed be applied with precision and in such a manner that they will stretch the curves and distorted ribs, and not the other portions of the spine. If they are applied with care and skill, satisfactory results can be obtained in suitable cases. When, however, any alteration in the shape of the bones has taken place, the use of a stronger correcting force is necessary and should be applied as constantly as is practicable. For this purpose nothing is as efficient as the fixed plaster jacket, applied with the patient in a corrected position, or in a position as nearly corrected as is possible for the patient to endure. The feasibility of the thorough application of this method has been demonstrated in a number of cases. Surgeons, however, vary in regard to the manner of application; whether the patient should be in a recumbent position, whether suspension should be used, what form of correcting apparatus should be employed, are matters which have not yet been thoroughly decided, surgeons varying in the use of different apparatus.

The work at the Children's Hospital, in the past year, ably conducted by Drs. Lovett and Brackett, has illustrated the efficiency of the methods of treatment for this deformity, and their application.

A report of their work is presented in an accompanying paper and needs no comment. A successful system of treatment possible in an institution is described. The general practitioner, while accepting the principles of treatment, will need for his own practice the simplest of arrangements.

An appliance for the application of plaster jackets in lateral curvature, which has certain advantages in portability, has been used by the writer. It is eminently one which can be employed by the practitioner and can be readily made and is easily transferred. The design of this apparatus is better shown in the accompanying illustrations than in any description. It is necessary that judgment should be used in the use of corrective force, and a certain amount of skill is required in order that jackets put on will be borne by the patients. It is, of course, undesirable that the first jacket should be applied with a distressing amount of force. Windows can be cut in the plaster, allowing respiration in the portions of the spine which do not need pressure, but in any event the application of a plaster jacket, if any corrective force is used, should be only employed when it is possible to watch the patient for twenty-four hours after the application. In most jackets it is necessary that the bandage should be applied above the shoulders. It is rarely necessary to include the head, though in the most severe upper curves this would undoubtedly be advisable. Repeated applications of the jacket are necessary if much correction is expected, jackets being worn a longer or shorter time according to the amount of force which has been used in the application. A surprising amount of benefit can be obtained by this method, if persisted in for a sufficient length of time, and in young cases a complete correction is possible. The greater the amount of structural change and the older the patient, the less the amount of practical correction which can be expected.

It is manifestly impracticable to keep a patient in a fixed immovable plaster jacket during the whole growing period;

FIG. I.—Simple portable arrangement for application of corrective jackets for scoliosis. Three stands with uprights adjustable in length are secured to a board placed against the back of a steamer chair. The upper supports the neck, the lower the sacrum, and the middle presses on the scoliotic hump. Counter pressure can be made on the thorax in front by means of a lever rod (armed with a pressure pad) tied at one end to the side of the chair and pressed by an assistant at the other end. A projecting shoulder can be tied back by a bandage.

although this would be desirable for the purpose of shaping the growth of the distorted bones, yet it would be decidedly disadvantageous for muscular development and for the general activity of the patient. It is for this reason that fixed plaster jackets should not constitute a method of treatment any longer than is absolutely necessary. They should be followed as soon as possible by removable corsets and by the use of gymnastics. Removable jackets can either be made of plaster, leather, celluloid, or of cloth reinforced by properly applied steel bands. These removable corsets should be regarded as applicable when the danger of increasing growth has passed, or when the greatest amount of correction has been obtained.

That form of removable plaster jacket which is most within the reach of the general practitioner, can readily be made if a plaster jacket is removed from the patient and a cast is poured into the jacket, thus making a mound; around this a plaster jacket may be applied reinforced by bandages which are rolled in a mixture of dextrine and plaster of Paris. A jacket made in this way requires a longer time to harden than the ordinary bandage, but is somewhat more elastic and durable. If split and arranged with lacing it will serve as an adequate jacket to a faulty position.

As the treatment of lateral curvature requires painstaking attention intelligently employed in the direction of gymnastics, in the application of correcting force, the aid of the specialist is usually of advantage; but as the affection is one to be considered during the growing years especially, careful oversight is needed for several years. This is particularly the province of the family physician, and it is essential that the best methods of treatment be brought to his attention.

DISCUSSION.

Dr. E. G. Brackett, of Boston: As it has been very clearly presented in the preceding paper, very marked advance has been made in the treatment of lateral curvature during recent years, and the practical application of certain definite principles is now pretty clearly understood, and so far as it concerns private patients, it has become one of the satisfactory conditions to treat. There is a class of cases, however, with which it is a difficult problem to deal, for the reason that it is impossible to give the individual care and attention that one can give to private patients, and which is necessary for the successful treatment. I refer to the class of hospital cases, which necessarily must make up a large bulk of the cases which need treatment. The treatment must be frequently given, and must be carried over a long period of time, frequently over the years of the child's growth. It may be of interest to some to know in what way and in what measure this problem has been met in the Children's Hospital. Prior to 1890, no attempt had been made to treat separately cases of lateral curvature from other orthopedic cases presenting themselves in the Out Patient Department. They were treated when they appeared, but with the facilities at our disposal satisfactory treatment, gymnastic or otherwise, could not be carried out. The number of cases was on the whole small. From 1886 to 1890 only 87 applied for treatment during the regular Out Patient hours.

In 1890 an attempt was made to treat cases more systematically, by setting apart a room in the Out Patient Department for the purpose, and by having the children come on Monday and Wednesday afternoons, and later on Saturday mornings as well. The assistance of graduates of some of the normal schools of gymnastics was secured, and exercises were given regularly by them, under supervision. Under this plan a large number of children came for treatment, and were regular in attendance. Two or three years later the cases of lateral curvature coming for treatment on Tuesday and Saturday afternoons were separated from the other cases, and were treated at first by a graduate of one of the normal schools, and later another graduate had the

assistance of pupils from one of the normal schools. Later a large room was secured in the Out Patient building, apparatus was added, and the two clinics were run separately with different sets of assistants, each under the supervision of one of the assistant surgeons.

Under this method the number of cases presenting themselves for treatment constantly increased until in 1900 over a hundred cases were on the regular attendance list.

In the Spring of 1903 both clinics were united, and the present system of organization adopted with the view of obtaining a uniform system of records and treatments for all cases, and securing more frequent attendance of patients, and Monday, Tuesday and Wednesday afternoons and Saturday mornings were set aside for their regular periods of treatment. The clinic is held in the former lecture room of the Out Patient Department, which is fitted up with a few pieces of apparatus for restoring flexibility, and although entirely inadequate to the number of cases coming is better than any combination that we have had in the past. The clinic is in charge of the two assistant surgeons of the hospital, who serve six months at a time alternately. There are two medical assistants, graduates in medicine, who assist for terms of three months each, in the instruction and care of cases and fitting of apparatus. The gymnastic work of the clinic is in charge of a graduate of experience of one of the normal schools of gymnastics, and who works under the direction of the assistant surgeon on duty. She has eight or ten assistants, women graduates of normal schools or advanced pupils in these schools, and who serve for terms of three months each and give the exercises to the children. They receive instruction from the assistant surgeons in the form of informal talks, and have instruction in measuring of cases, in keeping of records, and assist in the application of plaster jackets forcibly applied, and have an opportunity to learn the principles of photographing cases. Among the graduates who have taken the course since the first of June, 1903, are three assistant instructors of physical training in the Boston public schools and two directors of physical training in large women's colleges. The instruction given is of the simplest kind, and is intended to cover the practical aspect of lateral curvature.

The supply of patients has been far beyond our capacity, and occasionally it has been necessary to stop the admission of cases, and there are now in the more or less active treatment about one hundred cases. Each child when it first comes has its history taken, a careful physical examination, and a description of the curve is made by one of the assistant surgeons and is recorded on a card. General measurements with the antero-posterior tracing are made and recorded, and to complete the record the patient is photographed. These photographs are taken under constant conditions with the patient at a fixed distance from the camera, with the feet in the same position on an elevated pedestal, by which method one is able to have a fixed size for all photographs and relative measures taken by scale. All cases then receive a prescription for exercises, and are placed in charge of the gymnastic superintendent of the clinic. The treatment is advised according to the grade of the curve. The following grades are recognized.

(1) Slight postural cases. If the case is one of slight postural curve, the child is placed in a class coming from one to four times a week, as may be necessary. It is given exercises for half an hour daily at a fixed time. A number of types of class work have been tried and compared. It is necessary to have two separate classes exercise at different hours to accommodate the number requiring this kind of work. This class work is, of course, inferior to individual work, but there has been the alternative of either refusing these cases or treating them in this way, and as each child is given these exercises to do at home, the result of class work has been on the whole satisfactory, and many cases have shown a marked improvement. Gymnastic work at home is to be considered an essential part of the treatment. A strict discipline has to be maintained in matters of appointments. Any child missing two, without giving notice, is dropped temporarily, losing its place, and is only reinstated after an interview with the parents. This is found to have a most stimulating effect upon attendance at class. In this class of cases two means of treatment are clearly formulated: (a) restoration of flexibility, (b) sense of corrected position by muscular effort. For the restoring of flexibility, the ordinary methods of hanging by arms, head suspension, bending, etc., are used. There are two

pieces of apparatus for applying pressure locally while patient is held extended, and two pieces of apparatus for applying side pressure while the patient lies prone. If patient can hold correct position from one treatment to another, apparatus is not used. If patient shows a tendency to slip back between the treatment, and at the beginning of each treatment is in a less correct position than at the end, some form of retentive apparatus is used. Patients of this grade do not exercise in class, but receive individual appointments, and have the attention of one teacher for half an hour every day from one to four times a week. Home work also forms a part of this treatment, with patients whose parents are intelligent enough to carry it out.

(2) The severest cases, which are treated by forcible correction and plaster jackets, are treated by the use of apparatus for exerting pressure to correct both the side deviation and rotation. Jackets are applied in succession until as much correction as seems possible has been gained. The last jacket applied is then used as a torso, which is moulded to exert pressure where it is wanted, and a permanent jacket of leather made to be worn continuously by the patient, removing it only for exercising. Apart from this point, the treatment does not differ from that pursued in the medium grade of severity, namely, to increase flexibility in desired direction, and exercises to improve muscular condition.

Although in so long continued an affection as lateral curvature it is difficult to secure the attendance of the patients for a sufficient time and the individual co-operation of the parents, on the whole the results have been satisfactory. In the cases of milder grade improvement has been the rule, and such cases have been excused from active treatment and placed wholly on home work, reporting occasionally. In cases of the medium grade marked improvement has been made in some, others remained where they were, while others from one reason or another have increased. In the severest condition the results of the forcibly corrected jackets have been satisfactory, and much improvement secured in them. The organization of the clinic is given, not because it is by any means what is desired, but because it represents a working scheme which gives fairly satisfactory results in the large number of cases treated in insufficient quarters.

ARTICLE XLVII.

OBSTRUCTIVE RENAL RETENTION WITH ANURIA, AND ITS TREATMENT.

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OBSTRUCTIVE RENAL RETENTION WITH ANURIA, AND ITS TREATMENT.

This communication deals with those forms of renal retention only with which anuria is associated, and which originate in complete closure of the ureter or of the outlet of the renal pelvis.

As used here, anuria is intended to denote the reduction of the urinary secretion to a few drops in the course of each twenty-four hours; that is to say, the anuria which is termed *absolute*.

The phenomena which are observed in the kidney when its urinary outflow is completely obstructed, are as follows:—

1. Increased intrarenal pressure.
2. Congestion and œdema of the organ under the influence of which it becomes enlarged.
3. Rapid diminution of the urinary secretion and change in its chemical character; the latter consisting in a marked reduction of its solid constituents.

After the obstruction has existed a few hours, the urinary secretion is almost absolutely suppressed, a few drops only being secreted in the course of each twenty-four hours. Owing to this latter fact, hypernephrosis in a marked degree is seldom seen in connection with complete, continuous obstruction. The enlargement of the organ is almost wholly due to congestion, and the urinary accumulation plays but a secondary part in its production.

4. When the obstruction has existed for forty-eight hours or so, destructive changes begin in the renal epithelium and in the glomeruli. Once begun, they advance until the obstruction is removed. Their extent is therefore proportionate to the length of time during which the obstruction is present. If the latter lasts long enough, total destruction of the organ results.

5. If the kidney is infected, the destructive changes take place more rapidly than when it is not infected.

6. The degree of functional capability that is retained by an obstructed kidney, cannot be determined by the thickness or thinness of the cortical substance that is found when operation is performed upon it, for the essential changes upon which the future of the kidney depends are histological in character. Thus there may be in one case a very thin layer of the secreting substance which has not been invaded by the destructive changes to such an extent as to prevent its performing useful service for many years after the renal obstruction has been relieved, while in another instance in which there is a comparatively large amount of the renal parenchyma left, its working capacity may have been practically destroyed by the changes which have taken place in it of a destructive nature.

7. The only means of estimating the future functional capability of the obstructed kidney is by examination of the urine that comes from it after the re-establishment of the urinary secretion. This, however, cannot be determined from the urine passed *immediately* after the removal of the obstacle, for there are intervals of considerable length — sometimes from four to six months — during which the urine continues to be poor in solid constituents, and yet, at the end of this time, it may show such improvement as to indicate that the organ is doing useful work.

The above is a bare outline of the more important changes that take place in the kidney under these condi-

tions. The essential things to be remembered in connection with them are: The longer the kidney remains obstructed, the greater is the extent of the injury done to it, and correspondingly, the greater is the patient's danger; that the destructive changes in the organ begin within a few hours after the establishment of the obstruction, and that they progress more rapidly when the kidney is infected than when it is not.

Anuria.

It is customary to assert that the anuria seen in connection with these cases does not occur if the kidney of the other side is normal, and that in order to have it produced, one or another of the following conditions must be present concomitantly: 1. Absence of the other kidney, or disease of it sufficiently serious to have destroyed or greatly injured its functional capability. 2. Simultaneous obstruction of the ureters of both kidneys or closure of the single channel made by their fusion, such as is seen in connection with certain renal anomalies.

In other words, that reflex influence is not capable of suppressing the urinary function of the other kidney when the latter is normal or but moderately diseased.

That this is not absolutely the fact, is shown by two or three post mortem observations in which the unobstructed kidney *was* found to be normal or very nearly so. Further evidence in support of the occurrence of reflex suppression under such circumstances is supplied by two clinical observations and by some recent experiments of Götzl.

The former consisted in having found the opposite kidney to all appearance normal, in a case in which it was cut down upon and incised after a primary operation on the other kidney, the second operation having been done because of the persistence of the anuria after the first one, and in another case in having drawn normal urine from the oppo-

site kidney by a ureteral catheter after the re-establishment of the urinary secretion.

In the experimental work of Götzl, he succeeded in producing complete suppression of the urinary secretion of one kidney by increasing the intrarenal pressure in the other, in two of twelve dogs which were used in the experiments.

It is to be noted, however, that similar experiments performed by others have not yielded the same results as those of Götzl.

I have dwelt upon this feature of the subject because of its possible importance with relation to the surgical treatment of those cases in which the anuria persists in spite of the relief of the obstructed kidney afforded to it by a nephrotomy. For it suggests that there may be a reasonable chance of re-establishing the urinary secretion in such instances by exposing and incising the other kidney, should the anuria persist for twenty-four hours after the nephrotomy has been done on its fellow, when the former and if the former is normal or but moderately diseased and its function suppressed by reflex influence only. That these conditions are rare is undoubtedly true.

The most striking feature of obstructive anuria is the length of time it may last without giving rise to uremic symptoms and without causing death. These are the characteristics which serve to distinguish it from the anuria which occurs in connection with other conditions.

In order to determine various points in connection with this subject, I have collected and analyzed two hundred cases published by different writers. These cases are derived from the following sources :—

Morris (Surgical Diseases of the Kidney and Ureter. 1902).

Schenck (Johns Hopkins Hospital Reports. 1902. vol. x., p. 447).

Tenney (Boston Med. and Sur. Jour., Feb. 4th, 1904).

In addition to the above are twenty-four cases, as follows :—

Loumeau,	2	cases.	(Compte rendu de l'Association Francaise d'Urologie, 1896–97, p. 194.)
Pousson	1	"	(Ibid, 1898, Vol. 3, p. 370.)
Vignard	1	"	(Ibid, 1898, Vol. 3, p. 378.)
Albarran,	1	"	(Ibid, 1898, Vol. 3.)
Escat,	1	"	(Ibid, 1898.)
Chevalier,	1	"	(Ibid, 1896–97, p. 485.)
Begouin,	1	"	(Ibid, 1896–97, p. 187.)
Chevalier,	1	"	
Duret,	1	"	
Desnos,	1	"	(Ibid, cited by Begouin.)
Championniere,	1	"	
Bazy,	1	"	
Nicholich,	1	"	(Ibid, 1903–04.)
Cabot,	2	"	(Annals of Surgery, 1903, October.)
Fairchild,	1	"	
McKay,	1	"	(Montreal Med. Jour., 1903, Vol. 32, p. 641.)
McArthur,	1	"	(Annals of Surgery, 1903, Vol. 37, p. 294.)
Bevan,	2	"	(Annals of Surgery, April 5, 1903.)
Grohe,	1	"	(Arch. fur klin Chir., 1902, Vol. 66, p. 178.)
Watson,	2	"	(Jour. Cutan. and Gen.-Urin. Dis., Vol. 9, and present communications.)

Duration of Anuria.

110 cases treated expectantly. 30 recoveries. 80 deaths.

In 20 of the cases in which recovery took place the duration of the anuria was as follows :—

Days.	Cases.	
1	1	
3	1	
5 to 10	11	(The larger number of these cases had anuria from 5 to 7 days.)
11	1	
13	1	
14	2	
15	1	
15 plus	2	
	20	

The duration of the anuria in 42 fatal cases in which its length is stated was :—

Days.	Cases.	
4	1	
5 to 15	25	(The larger number were between 5 and 8 days.)
15	2	
16 or more	14	(23 days was the longest period. There were remissions in a few of these cases.)

95 cases treated operatively. The duration of the anuria prior to operation was stated in 39 of these cases. Of these, 26 recovered and 13 died. In the 23 cases in which recovery followed operation, duration of anuria was :—

Days.	Cases.
1	2
2	2
3	2
4	2
5	2
6	7
7–8–9 (1 each)	3
11	1
12	1
13	2
14–15 (1 each)	2
	26

Fatal Cases 13. Duration of the anuria was :—

Days.	Cases.
2	2
4–5 (1 each)	2
6–7 (2 ")	4
8–9 (1 ")	2
12	1
4	1
5	1
	13

"*Period of Tolerance.*"

The time after the beginning of the anuria during which the patient remains free from uremic symptoms, is called the "period of tolerance." Its duration was stated in 62

cases. In the larger number of these it was from 4 to 7 days. In 4 it was 24 hours or less. In 2 it was 2 days, and in 14 it was from 10 to 16 days.

To what is to be ascribed the remarkable immunity to uremic intoxication displayed in some of these cases? The most plausible explanation seems to the writer to be that which is afforded by assuming it to be due to the so called "*internal secretion*" of the kidney.

The theory with regard to this distinctive functional office of the kidney may be expressed briefly thus:

Beside the separation of urea and other excretory products from the blood, with which we know the kidney is concerned, it has another functional duty, namely, that of secreting certain principles of unknown nature, which are returned to the blood through the renal vein, and which have a value in preserving the general nutrition and health of the organism and which moreover inhibit in some degree the action of the uremic toxins.

In support of this theory may be cited the experiments of Vitzou recently published. One of a large number of similar ones made by him will serve as an illustration of all of them.

Vitzou removed both kidneys from two dogs, from the renal vein of which he had previously drawn a certain quantity of blood, in such a way as to have it keep sterile. This blood was defibrinated, filtered, and placed in sterile glass jars until it was required.

One of the dogs was allowed to die without interference. The second one was given subcutaneous injections of the blood of the renal vein prepared as above described. The first animal died in thirty-four hours after its kidneys had been removed, presenting characteristic uremic symptoms. The other dog lived for nearly seven days, or 130 hours longer than the one which had not received the injections of blood from the renal vein. Moreover it was seen that the first

appearance of the uremic symptoms could be delayed for a good many hours if the renal vein blood was injected in anticipation of their manifestation, and also that they could be made to cease and their reappearance delayed for a considerable interval if the subcutaneous injections were given as soon as they were manifested and repeated between that time and before the next manifestation occurred. In order that this theory may become applicable to the cases which we are considering, we must assume that the "internal secretion" has not been arrested by the influences which have led to the suppression of the urinary secretion, and that it continues to supply those elements which inhibit the action of the uremic toxins, or which increase the resistance of the organism to them.

Other points which may be noted with regard to the anuria and uremic manifestations are as follows:

If the kidney which is obstructed is already hydronephrotic, the life of the patient and the period of tolerance are prolonged as compared with the cases in which hydronephrosis is not present.

Another feature that should be remembered is, that during the period of tolerance, the patients are frequently to all appearance in good health and that in some instances death has occurred suddenly without any uremic manifestations whatever, and not long after the beginning of the anuria. I can, however, find no instance in which this has been the case after a period of anuria of twenty-four hours or less.

No one can foresee at what moment uremia may occur, and Morris has well said that in these cases "uremia is always imminent."

Treatment. — In considering the treatment, we may separate the cases into two groups. 1—Those in which the symptoms are not sufficiently characteristic to enable us to recognize the nature of the trouble, or in which it is difficult

to determine on which side the obstruction is located, and 2—Those in which the diagnosis can be made with reasonable or entire certainty.

Belonging to the first group are patients who have pain on both sides, or who have had it previously, but who do not have it when seen by the surgeon; or again, such as have pain on one side and tenderness or spasm of the abdominal muscles on the other, etc., etc.

Under these circumstances—if the patient's condition is such as to permit it — the use of the X-ray, the ureteral catheter and the cystoscope may render valuable service. Otherwise the two latter are both unnecessary and useless in this class of cases.

In cases in which there has been pain on both sides, but in which it no longer exists when the patient is examined, and in which we are obliged to operate without delay, we should choose the side on which the pain was located last.

If we cannot determine which of the two sides is the seat of the trouble, it is better to take the chance of operating on the wrong one than not to operate at all; and if it is found that we have operated on the wrong side we should not hesitate immediately to expose and incise the other kidney.

In the other group of cases, viz., those in which there are *characteristic* symptoms, one or more of the following conditions are presented: Enlargement of the obstructed kidney, tenderness or pain of it; spasm of the abdominal muscles of that side, and, in the cases in which the kidney is infected, probably also chills or rigors, and nausea and vomiting.

Assuming that we have a case in which the diagnosis is reasonably assured, what is the treatment to be?

Apart from the surgical treatment, the following measures are available:

Subcutaneous injections of saline solution, with a view to delaying or mitigating uremic symptoms.

In cases of calculous obstruction; hot hip baths, and manipulation to aid the passage of the stone. The latter has often been successful.

Some surgeons advise the employment of anesthetics for the purpose of relaxing spasm of the ureter. Theoretically this is unsuitable in cases of anuria. Practically it has seemed to be beneficial in some of the cases reported.

When the obstruction is due to a kink of the ureter produced by movable kidney, the patient's hips should be raised, the abdomen relaxed, and the effort made to replace the organ in its normal position.

Operative Treatment.

Other than the above methods of treatment, there are two courses that may be pursued. 1—To treat the case expectantly. 2—To treat it operatively.

The decision as to which of these to adopt is not difficult in any case in which the diagnosis is reasonably clear. The evidence upon which this statement rests is: 1.—The knowledge that we have of the changes that occur in the kidney when it is completely obstructed. These have been already detailed in the first part of this paper. 2—The results of clinical experience. The latter is shown by the analysis of the 200 cases which are the basis for some of the conclusions arrived at in the course of this study.

Of the total number of 205, there were 110 patients treated expectantly, and 95 who were subjected to operation.

The mortality of those treated expectantly was 72.7%. That of those treated operatively was 46.3%.

It was also seen that the longer the operation was delayed after the beginning of the anuria, the higher the death rate became. Again, that a comparatively small number of the patients who had exhibited well marked uremic symptoms recovered under any form of treatment, and that

of those who did survive under such circumstances far the larger part were treated operatively.

Further, it was found that there have been a few instances in which patients survived who had profound uremia at the time at which the operations were performed, and who had also had long periods of anuria. Such cases are reported by Chevalier, Duret, and Desnos. They serve to show that we should never refuse to operate even under such unfavorable conditions.

Other determining factors are these: We know that if the obstruction is not relieved, the patient will die in a comparatively short time. We know that death may occur suddenly and soon after the beginning of the anuria without the patient having had uremic symptoms. We know that uremic manifestations may occur at any moment during the anuria, and that once they have appeared, death follows with but few exceptions within three or four days at most.

No one is capable of forseeing at what time these things may happen. No one can assert that the obstruction will be relieved spontaneously in any given case.

The fact that there have been some cases in which the obstruction has been relieved spontaneously after long periods of anuria and of tolerance, and that recovery has followed, does not justify us in delaying operation because of the hope or the expectation that the same experience will be repeated in any other case.

The conclusion, so far as the choice of treatment is concerned, is inevitable, and it is this—That in every case in which the obstruction has not been relieved by the end of the first forty-eight hours at most, operation should be performed. If uremic symptoms should appear before that time, operation should be done at once.

The delay of forty-eight hours is justified in some cases of calculous anuria, because we know that the destructive

changes in the kidney will not have advanced to an important extent before that time; because very few patients have died after periods of anuria of such short duration as that, and finally, because the calculus may pass at any time within that time.

In other words, so long as the kidney is not suffering injury of consequence and there is a fair chance of the obstruction being relieved spontaneously, there is no serious objection to waiting, but at the expiration of this time, delay is no longer permissible. The line which separates the one from the other of these periods may be drawn at the end of the first forty-eight hours, at the furthest, from the beginning of the anuria.

Choice of Operation.

Having decided as to the kind of treatment to be adopted in a general sense, there remains to be considered the choice of the operative method.

In a few cases of calculous anuria the cystoscope has detected the stone projecting from the mouth of the ureter, and it has been removed from within the bladder by the finger or by instrument.

When a calculus is situated close to the lower end of the ureter, it may sometimes be dealt with advantageously from within the bladder also.

Occasionally a calculus is so large that it can be felt through the abdominal wall, and it can be better approached by a more direct route than that offered by lumbar nephrotomy.

The limits of such a communication as the present one, do not permit me to enter into the question of locating calculus in the ureter, the relative frequency with which the different parts of the ureter are the seat of calculous impaction, etc. Moreover these matters have been very fully dealt with by Israel, Tuffier, Morris and others abroad,

and in this country, by Schenck of Johns Hopkins, and by Dr. Tenney here, in two admirable articles already referred to.

I shall therefore confine myself to the consideration of some of the more general features connected with the choice of operative method.

One broad proposition underlies and applies to the surgical treatment of all these cases. It is this: The essential point by surgical intervention, is the reestablishment of the urinary secretion by supplying a free avenue for the escape of the urine from the obstructed kidney by whatever operation will accomplish it most speedily and with the least shock.

There is no question that these requirements are best fulfilled by a quickly performed lumbar nephrotomy.

It goes without saying, that if at the same time the cause of the obstruction can be removed without thereby increasing the severity or prolonging the time of the operation to an important extent, it should be removed. Cases in which this can be done without too much risk, are those in which a calculus is impacted in the renal pelvis or in the upper third of the ureter, from which positions it may be removed usually without too much loss of time. Again, the time lost in anchoring a movable kidney which has caused a kink of the ureter and its occlusion, is usually not of enough consequence to deter us from doing it and thus preventing the recurrence of the trouble.

Of course it is understood that failure to remove the obstacle at the time of doing the nephrotomy, makes the establishment of a renal fistula much more probable. The evils of even a permanent renal fistula depend in large measure upon the ability to have it properly cared for, the patient's surroundings, his occupation, etc. It is by no means an unmitigated evil when the above factors are favorable.

I have a patient at this moment who has worn a bottle

attached to his back for ten years, and for the past year a second one as well. The urine of each kidney has been delivered into these receptacles respectively by tubes which are placed in the renal fistulæ in the two loins.

During the entire time he has been in excellent health; not a drop of urine leaks around the tubes; he soon became accustomed to them and suffers no discomfort whatever from their presence. He has been in active business all the while and no one has been aware that anything was the matter with him. The renal fistulæ have kept this patient not only alive but in perfectly good health all this time. To-day the kidney operated upon one year ago, has a percentage of urea of from 1.60 to 1.90. That of the kidney operated upon ten years ago—1.30 to 1.70 per cent. of urea. The latter has not varied from the time of the operation, in the sense of diminishing the percentage of urea found to be present.

The safety of the patient lies primarily in relieving the obstructed kidney. His future comfort may be imperilled by failure to remove the obstacle, but his life may depend upon not attempting to do so in the first instance.

The nature of the operations done in the ninety cases was as follows:—

	Cases.	Deaths.	Recoveries.	Mortality.
Lumbar Nephrotomy,	65	9	56	15.2%
Ureterotomy,	15	3	12	20.0%
Pyelotomy,	5			
Abdominal exploration and passage of calculus by manipulation,	2			
Exposure of kidney and incision of capsule,	3			
	90			

Immediate closure of the Nephrotomy incision.

The temptation is strong to close the kidney incision immediately, when we are sure that the obstacle has been

removed, and when the organ is not infected. It has been successfully done several times. But it should be remembered that it is the very fact of maintaining the opening in the loin, for a time at least, that allows the kidney to resume its function in whatever degree it is capable of doing. We know that this resumption is not immediate upon the removal of the obstacle, and finally it is possible, even in cases in which the obstacle has been removed, that we may invite a repetition of, or aid in maintaining, an abnormal degree of intrarenal pressure by immediate closure of the renal wound. On all these accounts it would seem wiser, therefore, to leave it open. In the instances in which the obstacle has been removed its healing will not be seriously prolonged by so doing.

If it is known that the patient has but one kidney, or that the function of the one which is on the side opposite to that which is obstructed is destroyed, this fact is a reason for operating sooner rather than later.

In this connection may be mentioned some of the cases of this sort which have been published:

Auvray.

Calculous anuria — destruction of the kidney of the other side by obliteration of the ureter. (Bull. et mem. de la Soc. Anat. de Paris. 1899, vol. 74, pp. 597–600.)

Loumeau.

Calculous anuria. Nephrectomy done on the other kidney one year previous. Patient refused operation, and died uremic on the 5th day. (Compte rendu de l' Assoc. Franc. d'Urologie. 1896–97, p. 194.)

McArthur.

Calculus removed from right kidney by nephrolithotomy. Nephrectomy done on same kidney later. Anuria. Nephrotomy upon the remaining kidney. Recovery. (Ann. of Surgery, Phila. 1903, xxxvii., pp. 294–296.)

Nicholich.

Calculous anuria. Nephrotomy on the 15th day. The kidney was tuberculous as well as obstructed. The other one had been removed for tuberculous disease some time before. Recovery followed the second operation. (Assoc. Francaise d'Urologie. 1903–04, vii., p. 639–642.)

McKay.

Pyonephrosis of left kidney. Nephrectomy. Subsequent calculous anuria from obstruction of remaining kidney. Nephrotomy. Recovery. (Montreal Med. Jour. 1903, xxxii., pp. 641–648.)

Ferguson.

Nephrectomy. Anuria from blocking of other ureter. Nephrotomy, and finally suprapubic cystotomy. Recovery. (Jour. Amer. Med. Assoc. 1903, pp. 8–10.)

Chevalier and Mauclaire.

Anuria of four days in a patient having but one kidney. Nephrotomy. Recovery. (Assoc. Francaise d'Urologie. 1896–97, p. 485.)

Two other cases which have not been published have come within my personal knowledge. In both, there was but one kidney. In both, the periods of anuria were comparatively short. They were thirty-eight hours and three days, respectively. Both patients recovered; one under expectant treatment, and one after nephrotomy and the removal of a calculus from the upper end of the ureter. In both cases nephrectomy had been done at some time previously upon the other kidney.

As has been said, speed in the performance of the operation is of the highest importance; often it will have the character of an emergency; and as we know, even such of the patients as do not show evidence of uremia or of being seriously ill, have all of them been accumulating toxic elements, and are not in condition to resist surgical operation well.

Any device, therefore, which will enable us to shorten the time of the operation is a most welcome addition.

I have derived the greatest assistance from the use of the "Kidney Operating Table" devised by Dr. J. H. Cunningham, of Boston, in the performance of all lumbar renal operations. It is, I think, far the best means at our disposal for the purpose, and I take pleasure in commending it to your favorable notice. I have asked Dr. Cunningham to demonstrate it here this afternoon, and I will not anticipate what he will have to say about it himself.

BIBLIOGRAPHY.

The following 22 cases are taken from the tables of Schenck and of Tenney, to which references have already been given in the body of the article:

		Cases.
Bardenheuer	1882	1
Bergmann	1887	1
Ceci	1897	1
Deaver	1902	1
Ferguson	1903	1
Hind	1894	1
Israel	1888, 1896	4
Kirkman	1889	1
Kadian	1894	1
Lagarosse	1892	1
Lucas		1
Legueu	1894	
	1895	3
	1895	
Medoza	1903	1
Morris		1
Morrison		1
Pousson	1894	1
Ralfe and Godlee	1889	1
		22
To these are to be added the 24 cases collected by the writer and quoted in the body of the paper.		24
The rest of the series of 205 is made up of the 49 cases noted by Morris as being treated operatively, and 110 cases treated expectantly		49
Operative cases,		95
Expectantly treated,		110
Total		205

Albarran. Communication upon the renal function. (International Congress, Madrid, 1903.)
Bevan. (Annals of Surgery, 1903, Vol. 37, p. 575.)
Cabot. (Annals of Surgery, Oct., 1903.)
Israel. (Chir. Klin. der Nierenkr. Berlin, 1901.)
Merklen, Pierre. (1881 Paris Treatise.)
Albarran. (Renal Retention.—Assoc. Francaise d'Urologie, V. 1, 1896.)

DISCUSSION.

Dr. Benjamin Tenney, of Boston, said that he had had an opportunity of seeing two types of anuria in the same patient on whom he operated. Some of these attacks before the operation lasted for eighteen hours. Fifteen months after the ureteral calculus was removed, the patient slipped and fell in a sitting position. This was followed by considerable pain on the operated side, and one month later he was called to see the patient who had been working on her feet for several consecutive hours.

On examination a tender swelling the size of a child's head and movable was felt on the left side. Within an hour after lying down with hips elevated the swelling entirely disappeared, and the patient's bladder had been filled and emptied twice.

The earlier attacks were due to the presence of the calculus, and the last to a kink in the ureter, caused by the slipping down of a large kidney. A second operation may be necessary to keep the kidney up in place.

Dr. Tenney agreed with Dr. Watson that anuria was frequently connected with a mechanical obstruction. In all the cases which he has looked up in connection with the article to which Dr. Watson referred, there was evidence of such obstruction.

In the twenty-one cases of anuria which appeared in the combined tables of Dr. Schenck and Dr. Tenney, there was an operative mortality of 52%. Morris speaks of forty-nine cases operated upon with a mortality of 49%, and compares this with the mortality of 80% in cases not operated.

The speaker believes that draining the pelvis of the kidney through the loin, added so little to the risk of an already grave condition, that it was the only treatment to be considered where the anuria had lasted more than thirty-six hours.

Dr. Paul Thorndike, of Boston: In the first part of his paper Dr. Watson called our attention to the well known fact that if the renal outlet is partially occluded for a longer or shorter interval there results a hydronephrosis, while if the obstruction is complete and sudden the renal function practically ceases with equal suddenness and the organ begins to degenerate. If there be an infection as well, the destructive process is so much the more rapid.

Now if the renal function is so interfered with that the unobstructed kidney ceases to functionate (from reflex causes) we get a more or less complete anuria, and if operation upon the obstructed kidney fails to re-establish the renal secretion it is conceivable that a second operation upon the other (unobstructed) kidney might be indicated. This has never come within the range of my experience and I should like to ask Dr. Watson what degree of suppression of urine would indicate the necessity for such an operation and how long he would wait after the first operation before cutting down upon the second kidney?

I wish to add my word of commendation for Dr. Cunningham's table. It has several times enabled me to explore kidneys and remove stones from them without the delivery of the organ on to the loin, and that is something which I have rarely been able to accomplish before.

ARTICLE XLVIII.

A TABLE FOR OPERATIONS UPON THE KIDNEY THROUGH THE LUMBAR INCISION.

By JOHN H. CUNNINGHAM, Jr., M.D.
OF BOSTON.

JUNE 7, 1904.

A TABLE FOR OPERATIONS UPON THE KIDNEY THROUGH THE LUMBAR INCISION.

THE difficulties encountered in performing operations upon the kidney through the lumbar incision are almost entirely due to the inability to get the patient into the desired position and to maintain it throughout the succeeding steps. The position of the patient attained by the use of sandbags or the Edebohl air cushion, so as to expose the lumbar region, is a very unsteady one to maintain even with the aid of assistants. The adjustment of the patient sometimes consumes much valuable time.

Also the space between the ribs and the crest of the ilium through which the kidney is reached cannot be opened to its full extent by these means, and a direct avenue to the kidney is necessarily small and the procedure of drawing the organ downward from beneath the ribs and into or through the wound is often difficult. This latter fact is likewise an important element in prolonging the operation.

With the view of retaining the patient in the proper position and doing away with the assistance necessarily employed for this purpose, and at the same time exerting the two forces so necessary in this class of operations, namely, opening the space between the ribs and the crest of the ilium, and pressure on the anterior surface of the kidney, forcing it upward and backward into the wound, I have designed the simple device which I have been requested to show. (Fig. 1.)

As you see, it is practically a double inclined plane, the inclines 25 in. x 20. in. and 10 in. x 20 in. are hung by hooks to a solid upright 10 in. high, 20 in. wide and 2½ in. through, which projects about 2 in. above the highest points of the inclines. The inclines may be suspended from lower hooks so as to allow about 3 in. of the upright to rise above the top of the inclines. The upright is fitted with two series of three holes bored at an angle of thirty degrees, 2, 3 and 5 in. respectively from either end, and into which a stake seven inches tall may be placed. The device may be used upon any table.

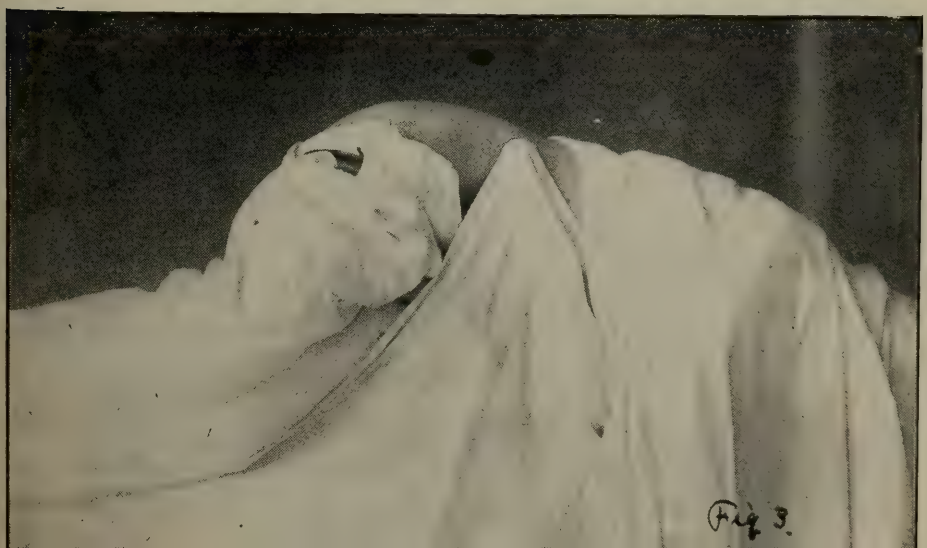
Unless the patient is very large the stake is best placed in one of the holes nearest the centre, and the incline suspended from the upper hooks. The table is then padded, and the patient placed on his side, with the region to be operated upon upwards. To secure the advantages of this special device, it is necessary to place the patient so that the upright will be just above the crest of the ilium, and the abdomen snug against the stake. The legs should be slightly flexed upon the long incline, whereby the patient is forced more strongly against the stake. A smaller stake may be placed in one of the holes of the other series to prevent the patient from slipping backward, although this is not, as a rule, necessary. (Fig. 2.)

The position is now firm and no assistance is necessary to maintain it. The space between the ribs and the crest of the ilium is open to its full extent, and a greater area of the kidney is uncovered by the lifting upward of the ribs. The force on the anterior surface of the kidney is constantly maintained by the weight of the patient against the stake.

As the incision is carried down to the muscles they are found to be on the stretch. When divided and the perirenal fascia opened, a kidney without adhesions will be forced immediately into the field of operation and delivered onto the loin with ease. The delivery of a kidney with adhe-

Fig. 1 shows table ready for padding.

Fig. 2 shows correct position of the upright above the crest of the ilium.



sions will be found greatly facilitated by the position, and by the influence of these two forces its delivery is rendered comparatively easy. (Fig. 3.)

Although the table was intended to be essentially a table for operations upon the kidney through the lumbar incision, it affords certain minor points of advantage; *e. g.* operations upon both kidneys as in double decapsulation. When used for this purpose the patient is placed face downward with the front of the abdomen resting upon the upright, so padded as to open the lumbar spaces of both sides and force the kidneys back equally well, if not better, than sandbags or the Edebohl air cushion. Also the upright does not sink into the whole upper part of the abdomen and press upon the diaphragm as do the other two means usually employed. Thus the excursion of the diaphragm is not interfered with and the patient's breathing is therefore more easy.

In gall-bladder operations, and also in laminectomy, the table may prove of considerable service; in the former by affording a means of getting under the ribs, and in the latter by maintaining a firm position and making more prominent the area to be attacked.

The important features gained by this device in operations upon the kidney through the lumbar incision are, first, that the patient is held firmly in the best possible position and without assistance. Second, the space between the ribs and the crest of the ilium is opened to its full extent, rendering the most direct avenue of approach to the kidney. Third, the force exerted upon the anterior surface of the kidney is constant and of sufficient strength to push the kidney into the wound, from which it may be delivered onto the loin, where it remains during the succeeding steps of the operation. By the accomplishment of these things much time is saved in performing the operation.

The table has been made by many different carpenters.

Those made by Charles F. Roberts, 10 East Springfield Street, Boston, have been satisfactory in every respect. The price of the table varies between four and five dollars, according to its finish.

ARTICLE XLIX.

EXAMINATION OF PLEURAL FLUIDS WITH REFERENCE TO THEIR ETIOLOGY AND DIAGNOSTIC VALUE.

By PERCY MUSGRAVE, M.D.
OF BOSTON.

READ JUNE 7, 1904.

THE EXAMINATION OF PLEURAL FLUIDS WITH REFERENCE TO THEIR ETIOLOGY AND DIAGNOSTIC VALUE.

The examination of pleural fluids for many years has furnished us with little valuable data upon which to base a positive or even probable diagnosis of the underlying cause of the effusion. To be sure the specific gravity and the amount of albumin have, in most instances, enabled us to differentiate between the exudates and transudates, and in few cases masses of the so-called cancer cells have been of positive diagnostic value.

In the last three years many investigators in Europe have done a large amount of work with reference to determining the cause of these effusions, and two new and valuable methods of investigation have been published.

In 1900 Widal and Ravaut* published the results of their researches based upon the differential enumeration of the white blood corpuscles and endothelial cells found in the sediments of serous fluids, and as a result have formulated the following laws, or so-called cytological formulæ:

1. A predominence of lymphocytes means a tubercular effusion.

2. A predominence of polyneuclear leucocytes means an effusion of an acute infectious origin.

* Widal and Ravaut. Compt. Rend. De La Soc. De Biol. De Paris. 1900. Page 648.

3. A large number of endothelial cells, occurring especially in sheets or plaques, means a mechanical effusion or transudate.

They also divide tuberculous pleurisy into two classes. The primary form, in which there are no discoverable lesions of the lungs, and the secondary form resulting from an underlying tuberculous lung focus.

In the secondary variety the lymphocytic formula, as seen in the primary form, is usually not found, but instead the sediment is almost entirely composed of necrotic cells and detritus. Of the distinguishable cells a large proportion may be polyneuclear. This difference is probably due to a mixed infection.

Of the acute infectious varieties they note those due to the pneumococcus, streptococcus and staphylococcus. In the pneumococcus variety they described the occurrence of considerable numbers of large cells having phagocytic properties. In the streptococcus variety these cells are comparatively few in number and the percentage of polyneuclear leucocytes is greater.

These formulæ have been extensively investigated by numerous observers, especially in France, and, to a lesser extent, in Germany, and have in the main been found correct. Certain modifications, however, must be taken into consideration. The chief of these modifications which has been pointed out especially by Naunyn* is, that lymphocytes may also predominate in transudates of long standing or near the end of an acute infectious case where the process is subsiding or where the infection is a very mild one. The specific gravity and the amount of albumin aid us in eliminating the first mentioned of these conditions, and the clinical evidence usually gives a clue to the nature of the process in the second condition. Both of these conditions are rarely met with.

* Naunyn. Uber Cyto diagnostik der Pleuraexsudate. Deutche Med. Wchnschr Leipz u Berlin 1903, April 30, 1903. xxix. Ver. Biel Page 140.

In the first week or ten days of a tuberculous effusion polynuclear elements may predominate, but these rapidly disappear and give place to a purely lymphocytic formula.

The phagocytic cells mentioned above as occurring especially in the cases of pneumococcus origin are of very large diameter as compared with the other elements occurring in the sediment, and I have frequently found that they measure as much as twenty microns. These cells frequently contain partly digested polynuclear and other cellular elements, which can easily be seen included in their protoplasm. Their occurrence in large or increasing numbers is usually a good prognostic sign, and their absence, together with the presence of bacteria, is usually a warning of approaching empyema.

From the observations which I have been able to make, the presence of polynuclears in a proportion of over 90% and the presence of bacteria in most cases precedes an empyema by only a few days.

Little need be said of the formula for the transudates except that the diagnosis is occasionally complicated by the presence of a considerable amount of blood which raises the specific gravity and the amount of albumin. This blood is usually accidental.

In addition to these above three classes of fluids we have the cancerous cases. These are difficult to diagnose, since the majority of pathologists agree, I think, in saying that it is difficult to differentiate the so-called cancer cells from endothelium, unless actual pieces of the cancerous tissue can be isolated. The iodine reaction (showing glycogenic degeneration) was thought at one time to be suggestive of the cancer cells, but this reaction is very commonly seen in the endothelial cells of simple transudates and in other conditions where endothelium is found.

The few cases of cancer that I have been able to study have shown a high specific gravity, 1,018 or over, and an

albumin content of over 1.5%. The sediment has shown many more endothelial cells than are found in the tuberculous cases and these cells are often found in plaques. This is very rare in tuberculosis. There is usually a much larger number of lymphocytes proportionally than in the simple transudates.

In addition to the above method of investigating pleural fluids, to which the writers have given the name cyto-diagnosis, Jousset* has published a new procedure for the detection of tubercle bacilli in these fluids, to which he has given the name of inoscopy and which is of value in some cases.

The technic of cyto-diagnosis is as follows:

The fluid should be drawn with the usual aseptic precautions into sterilized flasks or tubes. If it is already clotted when received for examination, it should be shaken and stirred with a glass rod until the clot is thoroughly contracted and the clot, or all clots of large size, should be removed. This is necessary because some of the cellular elements are entangled in the fibrinous meshes and by contraction of the clot are set free.

Widal and Ravaut accomplished the process of defibrination by placing sterilized glass pearls in the flask and shaking the fluid thoroughly. This I do not believe is essential for an accurate differential estimate of the cellular elements.

The fluid is then placed in centrifuge tubes and centrifugalized for five minutes at least.

Decant the supernatant fluid gently at first, and when only a small amount remains invert the tube for a few seconds. A few drops will adhere to the side.

With a small platinum loop stir the sediment thoroughly, rubbing the sides of the glass to remove adherent portions.

* Jousset. Soc. Med. des Hosp. 9 Jan. 1903. Sem. Med. No. 3, 1903, p. 22.

When the sediment is thoroughly mixed with the few drops of fluid remaining after decantation, remove a drop of the mixture with the platinum loop and make a cover-slip smear. Allow this to dry spontaneously or by gently heating the preparation. (Heating at the boiling-point will spoil the preparation.)

Many methods of fixing and staining these preparations have been used by the various investigators. Alcohol, and ether, chloroform vapor, and osmic acid have been used as fixative agents. Ehrlich's triple stain, hæmotoxylin and eosin, methylene blue and eosin, Lœffler's blue, and a great variety of other stains have been employed.

Some writers have maintained that careful differential staining was not essential, but from my observations I cannot ageee with those holding these views, for the reason that careful differential staining of the protoplasm and granules of the polynuclear elements is essential, since the nuclei of these elements are often globular when the cell is degenerated, and they may be mistaken for lymphocytes.

The method of staining which has given the best results in my hands is practised as follows:

Cover the preparation with a staining fluid composed* of

Wright's blood-stain, 3 parts.
Pure methyl-alcohol, 1 part.

Allow this mixture to remain on the preparation twenty to forty-five seconds, then dilute it with eight or ten drops of water, and allow it to stand one or two minutes.

Wash very gently, preferably by flooding the slide with a dropper. Do this four or five times, allowing the water to remain on the slide a few seconds each time. Vigorous or forcible washing will destroy the film and spoil the preparation.

Dry the preparation by holding it between the thumb

* Wright, J. H. The Journal of Medical Research. 1902. Vol. II., pp. 138–144.

and forefinger and waving it through the Bunsen or alcohol flame. Do not attempt to blot the preparation or heat it above the temperature which the fingers will bear.

Mount in xylol-balsam and examine with an oil-immersion lens.

Inoscopy is practised as follows:

1. The fluid should be drawn with aseptic precautions into sterilized flasks (Ehrlenmeyer flasks preferably) and at least 100 c.c. should be taken, although results may sometimes be obtained with much smaller amounts. Allow the fluid thus taken to clot.

2. Shake the fluid gently to contract the clot as much as possible, and then wash it on a piece of sterile linen or fine gauze wrapped over the end of a funnel, until all the serum is washed away.

3. Remove the clot or clots with a sterile spatula, and place it in a small flask with sufficient of the following fluid to digest it:

Pepsin,		2 gm.
Pure glycerin,	each,	10 c.c.
Strong HCl,		
Sodium flouride,		3 gm.
Distilled water,		1000 c.c.

The amount of this fluid necessary will vary, of course, with the size of the clot to be digested, but 20 or 30 c.c. is sufficient in most cases. A freshly prepared pepsin — HCl solution — apparently serves as well as the above fluid, but will not keep on standing as the above fluid does.

4. Place the above preparation in the incubator or oven until the clot is digested. A temperature of 37C. for two or three hours will suffice, but the time is shortened if kept at a temperature of 50C.

5. When the clot has disappeared, pour the mixture into centrifuge tubes and centrifugalize for five or ten minutes. Decant the supernatant fluid as described under cyto-diagnosis.

6. Make a cover-slip preparation and stain it for tubercle bacilli. Care, however, should be taken not to decolorize too long — one-half to three-quarters of a minute with Gabbet's solution is sufficient. Dry and mount.

The majority of the bacilli found by this method are shorter and broader, as a rule, than the tubercle bacilli usually seen in sputum, and some are paler red, but all forms occur. These bacilli may occur singly or in groups. The largest part of the sediment consists of undigested nuclei and a small amount of detritus.

Chiefly through the courtesy of the Visiting and Out-Patient Staff of the Massachusetts General Hospital I have been enabled to make systematic examinations upon seventy-two cases of serous fluids withdrawn from the chest, and the remarks and conclusions which follow are derived from the study of these cases with reference to their clinical history, chemical and microscopical examination of the fluids, and from animal inoculations and cultures in a large number of the cases.

For the sake of convenience, I shall divide these cases into four classes according to the diagnoses justified by the examination of the fluids:

Class 1. The Tuberculous cases.
Class 2. Acute Infectious cases.
Class 3. Mechanical Effusions or Transudates.
Class 4. Cancerous cases.

TUBERCULOUS CASES.

The largest number of cases examined must be classified under the first heading. Of these there are fifty-one. To follow out the scheme of Widal and Ravaut,* this class must be further sub-divided into the primary and secondary tuberculous cases, namely, those cases in which the sputum is negative, and there are no demonstrable lung lesions, will be classified as primary; those cases in which the exami-

* Widal and Ravaut. Loc. cit.

nation of the sputum shows tubercle bacilli will be classified as the secondary cases. This is by no means a strictly anatomical classification, but an arbitrary one used for the sake of convenience. Before dividing them into these two sub-classifications I shall speak of the tuberculous cases as a whole. Out of fifty-one cases, twenty-eight were positively proved to be of tuberculous origin, 54.5%. They were proved by one or more of the following methods:

Animal inoculation;
Presence of tubercle bacilli in the sputum;
Operation;
Inoscopy.

Seventeen cases, 33%, in this series gave positive results when inoculated into guinea pigs, producing unmistakable anatomical lesions in these animals from one or more of which in every case bacilli were demonstrated by cover-slip preparations. In thirty-three cases the animal inoculated showed no evidence of tuberculosis.

Inoscopy was positive in ten, 45.4%, out of twenty-two cases in which examinations by this means was possible. This method was not applied to cases examined before September 4, 1903, but since then it has been brought into use on all cases in which there was sufficient coagulum. In a considerable number of the cases this was so small as to exclude the possibility of doing inoscopy, and I have not yet been able to find any practical and simple method of causing these fluids to clot.

The bacilli found were, in the majority of cases, short forms resembling the tubercle bacillus grown on culture media, and in some instances resembling the familiar form of tubercle bacillus seen in sputum.

In two cases bacilli were found both by inoscopy and in the lesions in guinea pigs.

In five cases the tubercle bacillus was found in sputum; in two of these animals inoculation was positive, and in two negative, and in one case no other tests were applied.

One case was proved by the tuberculin test and subsequent operation for tubercular peritonitis.

As I have just shown, forty-six of these cases come under the heading of primary tuberculous pleurisy and five under the heading of the secondary form. Twenty-three, 50% of these cases, as I have shown, were certainly tuberculous. Of these, the differential counts of the white cells in the sediment showed a marked predominence of lymphocytes in twenty-two of the twenty-three cases. In one case necrotic changes in the sediment rendered the differential estimation of the cells impossible. In other words, the lymphocytic formula as described by Widal was found in twenty-two out of the twenty-three cases; in one case the diagnosis which was indicated by the sediment would have been secondary tuberculous pleurisy but no bacilli were found in the sputum. Out of the twenty-three unproved cases of this series, twenty-two showed an unmistakable predominence of lymphocytes.

The question now naturally arises—What evidence have we that 50% of this series is tuberculous, seeing that we have been unable to prove it? The clinical history in both the proved and the unproved cases is identical, namely, that the majority show an insidious onset with pain in the chest, slight cough, with or without sputum, and gradually increasing dyspnœa and anorexia. An appreciable elevation of the temperature may or may not be present in any of these cases. The appearance of the patient does not give us any differentiating clue. In other words, the clinical picture is the same in both series.

Of the twenty-three unproved cases two can be excluded as in all probability not tubercular by means of the clinical history. One was an unmistakable pneumonia followed by a pleuritic effusion; the other was a case of myocarditis and from the specific gravity was, without much doubt, a case of transudate; in other words, the examination of the

sediment led us to faulty conclusions. (Cases 51 and 50.) In one case there was a history of trauma and, although the specific gravity and albumin were both high and the sediment showed a marked predominence of lymphocytes, the question arises if this does not fall into the class of mild acute infections which I have previously mentioned as a source of error. (Case 48.)

Another case, coming on eight days after labor with sudden onset, suggests the possibility that this case also may be one of the same nature. (Case 41.)

It is also fair to exclude a fifth case where pleural effusion arose in the course of a lymphatic leukæmia, since the number of lymphocytes in the blood in this case would strongly suggest that their presence in the pleural fluid was of blood origin. The white count was 711,900, the differential count showing five-hundred lymphocytes in a count of five-hundred cells. (Case 39.)

Of the remaining eighteen cases the history in four suggests a tuberculous origin. The reasons for the failure to obtain proofs in these cases, although theoretical, are certainly plausible by analogy.

Out of fifty animal inoculations made with the fluid from cases showing the so-called tuberculous formulæ, even including the cases which we have shown were probably not tuberculous, only 33% appeared positive, but we have seen that by inoscopy we have been able to find bacilli in ten cases, only two of which gave positive results in the pig; in other words, where the bacilli were found by inoscopy the animal gave negative results. This suggests that in many of these cases the bacilli have lost their virulence for animals. This is also rendered more probable from the fact that I have several times seen organism within the cells of cover-slip preparations made from the sediment which would not grow on culture media.

As further illustrating the difficulty of proving these cases

in one of the series of proved cases (Case No. 2) inoculations of three animals from three successive tappings in November failed to give any positive results, but, although there was no change in the character of the fluid or in the condition of the patient, except for reaccumulation of fluid, an animal inoculated in May gave positive results, and another case (Case No. 14) in which three successive inoculations occurring within three weeks of each other were made from the fluid drawn from the same patient, the first animal inoculated was positive and the other two negative. Another case (Case No. 27) reacting to tuberculin and showing at operation tubercular peritonitis, gave negative results when inoculated into a guinea pig.

In Barjone and Cade's* series of cases it was not an unusual experience to have only one out of three or four animals inoculated respond.

This class of cases, namely, the so-called primary tuberculous cases, is the one which has given rise to so much discussion for the last twenty years. It was formerly attributed to taking cold, so-called "Pleurisy a Frigore," but the investigations of the French school, also those of Naunyn,† Litton and Wolff‡ have shown us that at least the great majority of cases are probably tuberculous. To Landouzy,§ Le Damany,‖ and Widal and Ravaut we are indebted more than to any others for the interest aroused in the investigation of this problem, and for pointing out valuable methods of investigation.

With regard to the cases of secondary tuberculosis little need be said, as, with one exception, they all show the formula described by Widal.

* Soc. Med. des hôp de Lyon, 7 Mars, 1902.

† Naunyn. Loc. cit.

‡ Litten & Wolff. Deut. Aerzte Zeit 1901 No. 18.

§ Landouzy. De la pleurisie dittes a frigore. Manifestation de tuberculose. Rev. de Med. 1886, iv.

‖ Le Damany. Recherches sur les pleurisies fibrineuse. These de Paris, 1897.

One case, however, did not show the necrotic, broken down sediment but an evident lymphocytosis; this, however, is not particularly significant since it would have led to the diagnosis of tuberculosis in any case. It is in this class of cases that the examination of the fluid is of the least diagnostic value since the diagnosis can be made in any event from the sputum.

It has been possible, however, in two of this series of cases to predict the finding of tubercle bacilli in the sputum, which subsequently occurred.

In one of these cases, reported in a former article, although the examination of fluid was that of a hydropneumothorax, or secondary tuberculosis, no proof of its being tuberculous could be found at that time, but subsequently, the patient re-entering the hospital, bacilli were found in the sputum.

ACUTE INFECTIOUS CASES.

There are twelve of these cases, six resulting in the course of an acute croupous pneumonia, one from infarction of the lung, with subsequent infection with the pneumococcus, three started from unknown sources, one from trauma and one from abscess of the liver infecting the pleura without rupturing into it.

In six there was no growth on culture media, two showed pneumococcus, two streptococcus, one staphylococcus, and in one no culture was taken.

In seven of the cases organisms were found on the cover-slip, usually few in number.

Five of these cases are of especial interest. In one (Case No. 63) where the diagnosis of an acute infection was established against a clinical probability of its being tuberculous, the examination was of great aid in determining whether or not an operation should be done for an abscess of the liver.

In one case (Case No. 53) it was possible to predict an empyema, which subsequently followed.

In two cases (Cases No. 60 and No. 61), although the fluids were serous, streptococci occurring on the cover-slip determined the advisability of immediate operations.

In one case (Case No. 52) in which the clinical diagnosis was endocarditis, and from that diagnosis it seemed most probable that the fluid was a transudate, examination showed an acute infectious process, and subsequently at the autopsy it was shown that the effusion was due to infarction of the lung which had been invaded by pneumococci with resulting consolidation. The sediments in these cases showed a predominence of polynuclear leucocytes.

TRANSUDATES.

Of five cases of simple transudate four appeared in the course of cardiac disease and one in the course of nephritis.

One of these cases (Case No. 67) illustrates the probable accidental occurrence of blood which, at the second tapping was not present, but instead the fluid had the characteristics of the typical transudate.

CANCEROUS CASES.

Three cases which I have been able to examine have all showed a relatively large amount of endothelium occurring with a predominence of lymphocytes. The endothelial plaques appeared in all of these cases, which we have previously mentioned were extremely uncommon in tuberculosis, and the albumin and specific gravity indicated an inflammatory process rather than a transudate.

Further research upon the formula for cancer is necessary.

One case cannot be classified from the examination of the fluid or from the clinical history. (Case No. 68.)

Class I. Tuberculous Cases.

Case 1.—A. C., 21, s., Italy, railroad brakeman. Aug. 3d, 1903. F. H. and P. H. negative. Habits good. Pres. ill. — No symptoms up to five days before entrance.

Chill(?), fever and malaise followed by severe pain in the lower left chest, increased by deep breathing and coughing. Phys. ex. — W. D. and fairly W. N. left pleural effusion; examination otherwise negative. Temperature at entrance 103.5 gradually reaching normal within a week. Pulse averaged 80, respiration, 25 to 30. Blood: whites—26,400; no Widal. *Aug. 4th, chest tapped, fluid:* amount 12½ ozs., hæmorrhagic, sp. gr. 1022, alb. 2%; sed: lymphocytes 85%, polynuclears 12%, large mononuclears 2%: large number of red corpuscles. Cultures: no growth. Pig inoculated; autopsy Sept. 9th; pig tuberculous bacilli demonstrated. Diagnosis from fluid: primary tuberculous pleurisy. Patient made marked improvement, no symptoms of cough, and was discharged relieved Aug. 19th. Clinical diagnosis: pleurisy with effusion.

Case 2.—J. S., 24, s, Italian, laborer. Nov. 13, 1903. F. H. negative, P. H. negative. Habits good. Pres. ill. —Dyspnœa for one month; no œdema; no palpitation; slight pain in left axilla; worked up to day of entrance. Loss of weight, night sweats, slight cough for two days, no expectoration. Phys. Exam.—W. D. & N., slightly pale, cardiac displacement to right, left pleural effusion; examination otherwise negative. Temperature irregular with moderate morning remissions; pulse averaged about 100 and respirations 20. Blood: whites—9,300. *Nov. 14th chest tapped, fluid*: amount 3 2-3 pints, color yellow, turbid, alkaline, alb. 2%, sp. gr. 1020, sed: lymphocytes 76%, polynuclears 18%, endothelial cells 5%, eosinophiles 1%; considerable number of red corpuscles. Dec. 1st, fluid had reaccumulated; tapped, amount 5 pints, hemorrhagic, considerable coagulum, alkaline, alb. 2%, sp. gr. 1020, sed:* lymphocytes 96% polynuclears 1%, endothelium 1%, large mononuclears 2%. Inoscopy negative. Three pigs inoculated: autopsies on Jan. 10th (2) and 15th negative. Patient improved, and was discharged much relieved, Dec. 17th. Clinical Diagnosis: pleurisy with effusion. April 20th, 1904, patient entered Out-Patient Department with pleural effusion. *Chest tapped, fluid*: straw colored, no coagulum, alb. 2%, sp. gr. 1019, sed: slight, lymphocytes 90%, polynuclears 8%, endothe-

* Two hundred and fifty cells were counted where no number is given.

lium 2%; moderate number of red corpuscles; no bacteria seen. Pig inoculated; autopsy May 17th, 1904; pig tuberculous; bacilli demonstrated. Diagnosis from fluid: primary tuberculous pleurisy.

Case 3.—F. D., 38, s, Canadian, building mover, Dec. 6, 1903. F. H. & P. H. negative. Habits: moderate alcoholic excess. Pres. ill.—For five weeks felt feverish and chilly, slight cough without expectoration, no pain; for four weeks has noticed increasing dyspnœa. Phys. exam. —W. D. and muscular. Lips slightly cyanotic. Heart not displaced. Lungs: right pleural effusion; examination otherwise negative. Temperature averaged between 101 and 102½ for eight weeks, gradually reaching normal in the 9th and 10th weeks; pulse averaged about 90 and respirations about 25. Blood: whites—6,900; Widal negative. *Dec. 8th, chest tapped, fluid*: amount 28 oz., color orange, considerable coagulum, alkaline, alb. 2½ sp. gr. 1020, sed: lymphocytes 91%, polynuclears 8%, eosinophiles ½%, large mononuclears ½%; cultures: no growth. Inoscopy negative. Pig inoculated; autopsied Jan. 15th, 1904; pig tuberculous. T. B. demonstrated. Diagnosis from fluid: primary tuberculous pleurisy. Patient improved slowly and Jan. 27th was discharged well. Clinical Diagnosis: pleurisy with effusion. Thickened pleura.

Case 4.—J. C., 25 s, Italian, laborer, Mar. 20, 1903. F. H. negative; P. H. unimportant; Habits good. Pres. ill.—For five weeks slight dry cough, for five days pain in left lower chest increased by deep inspiration. No sputum. Phys. Exam. W. D. & N. Heart not displaced. Lungs: signs of left pleural effusion; examination otherwise negative. Temperature averaged from 100 to 102, gradually coming down; pulse averaged 100; respirations 25 to 30. Blood: whites—10,600. Tuberculin test negative. *Mar. 25th, chest tapped, fluid*: amount 22 oz., straw colored, slight coagulum, alkaline, alb. 5.6%, sp. gr. 1020, sed: lymphocytes 99%, polynuclears ½%, endothelium ½%. Cultures: no growth. Pig inoculated; autopsied May 7th; pig tuberculous; bacilli demonstrated. Chest tapped again March 31st; fluid similar to that of the 25th; also April 4th chest tapped, fluid same. Diagnosis from fluid: pri-

mary tuberculous pleurisy. Slow improvement; April 24th discharged much relieved. Clinical Diagnosis: pleurisy with effusion.

Case 5.—T. P. M., 32. m, American, teamster. April 24th, 1903. F. H. One brother tuberculous (?). P. H. negative. Habits: slight excess of alcohol and tobacco. Pres. ill.—For three weeks moderate cough, no sputum; for six days increased cough with chill, headache, malaise, pain in left chest on deep inspiration; increasing dyspnœa. Phys. exam. W. D. & N. Color good: heart displaced to right. Lungs: signs of left pleural effusion; examination otherwise negative. Temperature averaged between 99 and 101, gradually coming down; pulse averaged 95; respirations 25. Blood: whites—7,300. *Apr. 26th chest tapped, fluid*: amount 1920 c. c., straw colored, very slight coagulum, alkaline, alb. 3%, sp. gr. 1023, sed: scanty, lymphocytes 98.8%, polynuclears 1.2%, few red corpuscles. Culture: no growth. Pig inoculated; autopsied June 1st; pig tuberculous. T. B. demonstrated. Chest tapped again April 30th and May 4th, amounts 36 and 24 oz. Fluids of the same character as that of the 26th. Diagnosis from fluid; primary tuberculous pleurisy. Discharged, much relieved, May 4th. Clinical diagnosis: pleurisy with exudation.

Case 6.—D. H., 41, m. American, lather, Sept. 21, 1903. (O. P. D.) F. H. & P. H. negative. Habits: alcohol to excess. Pres. ill.—Two weeks malaise, pain in chest, increased by deep inspiration; dry cough, anorexia. Phys. exam.—Heart negative. Lungs: left pleural effusion. Blood: No leukocytosis. Temperature not taken. *Sept. 21st, chest tapped, fluid*: amount 3 to 4 oz., orange yellow very slight coagulum, alb. 1½%, sed: lymphocytes 80%, polynuclears 13%, endothelium 3%, large mononuclears 4%. Culture: no growth. Inoscopy; not sufficient coagulum. Pig inoculated; autopsied Oct. 18th, 1903; pig tuberculous. T. B. demonstrated. Diagnosis from fluid: primary tuberculous pleurisy. Clinical Diagnosis: tuberculous pleuritic effusion and alcoholism.

Case 7.—W. D., 36, s, Canadian, engineer, Oct. 9th, 1903. (O.P.D.), F. H. & P. H. negative. Habits good.

Pres. ill. :—Came to the hospital for relief of dyspnœa and cough. Phys. exam. :—Temperature 98.8; heart displaced to right. Lungs :—left pleuritic effusion. *May 21st chest tapped, fluid* : amount 21 oz., sed : lymphocytes 72%, polynuclears 23%, endothelium 2%, large mononuclears 3%, considerable number of red corpuscles. Inoscopy. T. B. found. Pig inoculated; autopsied Dec. 4th; pig tuberculous. T. B. demonstrated. Diagnosis from fluid : primary tuberculons pleurisy. Clinical diagnosis : pleurisy with effusion.

Case 8.—S. R. (colored) 11, s, school girl. July 10, 1903. (O. P. D.), F. H. good. P. H. unimportant. Pres. ill. :—Cough accompanied by fever and night sweats, thick yellowish sputum. Phys. exam. :—Signs of bronchitis with question of apical phthisis. Sputum : no tubercle bacilli found. Aug. 28th. Sputum; no tubercle bacilli found. Phys. exam. :—Signs of bronchitis persist. Oct. 10th. Sputum; no tubercle bacilli : symptoms and signs same as before. Same condition continued with repeated examination of sputum up to Dec. 26th, 1903. Phys. exam. :—Temperature 100, pulse 120, respirations 44, heart displaced to right. Lungs : left pleural effusion. Blood : whites 13,600. *Chest tapped, fluid* : straw colored, moderate coagulum, alb. 1½% sp. gr. 1020, sed; lymphocytes 80%, polynuclears 15%, eosinophiles 2-5%, mast 2-5%, endothelium 1 1-5%, large mononuclears 3% ; few red corpuscles. Inoscopy negative. Pig inoculated; autopsied Jan. 20th; pig tuberculous. T. B. demonstrated. Diagnosis from fluid : primary tuberculous pleurisy. Entered the hospital Dec. 26th, 1903. Temperature fluctuated between 99 and 101, gradually coming down; pulse averaged 100 to 110; respirations 30. Blood : whites 12,100. Sputum : no tubercle bacilli found. Case improved. Jan. 3, 1904, discharged much relieved. Clinical diagnosis pleurisy.

Case 9.—M. C., 19, s, Greek, Aug. 1, 1903. (O.P.D.) F. H. good. P. H. unimportant. Pres. ill.—Pain in left chest, cough, slight expectoration. Phys. exam.—Lungs : left pleural effusion. *Chest tapped, fluid* : amount 8 oz., straw color, sed : necrotic cells predominate to such extent

as to render differential of little value, but majority of cells appear to be lymphocytes. Pig inoculated; autopsied Sept. 9, 1903; pig tuberculous. T. B. demonstrated. Diagnosis from fluid: secondary tuberculous pleurisy. Clinical diagnosis: pleurisy with effusion.

Case 10.—W. C., 52, m, Irish, laborer, Aug. 6, 1903. (O.P.D.) F. H. negative. P. H. unimportant. Pres. ill.—Came to the hospital on account of shortness of breath and anorexia. Difficulty in swallowing. Phys. exam.—Left pleural effusion. *Chest tapped, fluid*: amount 1½ pints, straw colored, serous, considerable coagulum, sed: lymphocytes 72%, polynuclears 24%, eosinophiles 1%, large mononuclears 3%; small number of red corpuscles. Pig inoculated; autopsied Sept. 9th, 1903; pig tuberculous. T. B. demonstrated. Diagnosis from fiuid: primary tuberculous pleurisy. Blood: whites—7,200. Last seen Aug. 10th, 1903, when he was improved. Clinical diagnosis: tubercular pleuritic effusion. Dysphagia.

Case 11.—H. P., 22, m, American, telephone operator, July 27th, 1903. (O.P.D.) P. H. negative. Pres. ill.—Four weeks before entrance had pain in right lower chest for three weeks, slight cough, some sputum, loss of weight 30lbs. Phys. exam.—Pleurisy with effusion. *July 28th chest tapped, fluid*: amount 39 oz., straw colored, sp. gr. 1020, sed: lymphocytes 96.7%, polynuclears 1%, eosinophiles .3%, endothelium 1.3%, large mononuclears .6%; few red corpuscles. Culture; no growth. Pig inoculated; autopsied Aug. 27th, 1903; pig tuberculous. T. B. demonstrated. Diagnosis from fluid: primary tuberculous pleurisy. Aug. 4th, 1903, patient seen for the last time; better. Temperature 99 to 101. Clinical diagnosis: tuberculous pleural effusion.

Case 12.—M. S., 15, s, Irish, rubber factory, Aug. 14, 1903. (O.P.D.) F. H. good. Pres. ill.—For two months intermittent pain in right side, slight cough; for one week cough has increased. Phys. exam.—W. D. and fairly nourished. Temperature 102½. Heart displaced to left. Lungs: right pleuritic effusion. *Chest tapped, fluid*: amount 30 oz., straw colored, slightly turbid, alb. 1½ %, sp. gr. 1016, sed: lymphocytes 86%, polynuclears 8%, endothelium 4%,

large mononuclears 2%; moderate number of red corpuscles. Culture; no growth. Pig inoculated; autopsied Sept. 14, 1903; pig tuberculous. T. B. demonstrated. Diagnosis from fluid: primary tuberculous pleurisy. Clinical diagnosis: pleural effusion; insidious onset.

Case 13.—H. McL., 50, s, Irish, mason, Sept. 4th, 1903. F. H. good. P. H. negative. Habits: slight alcoholic excess. Pres. ill.—For three weeks chilly sensations, slight cough, and pain in left chest; dyspnœa, occasional night sweats; lost 15 lbs. in a year. Phys. exam.—W D. and fairly W. N.; good color. Heart negative. Lungs: signs of left pleural effusion; examination otherwise negative. Temperature at entrance 103, falling to normal on the second day. Blood: whites—7,100. Sputum not obtained. *Sept. 4th, chest tapped, fluid*: amount 80 oz., straw colored, moderate sized coagulum, alb. 1.8%, sp. gr. 1018, sed: lymphocytes 94%, polynuclears 3%, endothelium 1%, large mononuclears 2%; few red corpuscles. Culture; no growth. Inoscopy. T. B. found. Pig inoculated; autopsied Sept. 28, 1903; tuberculous. T. B. demonstrated. Diagnosis from fluid: primary tuberculous pleurisy. Rapid improvement. Sept. 12, 1903, discharged, much relieved. Clinical diagnosis: tubercular pleurisy.

Case 14.—J. L. McN., 32, m, Canadian, teamster, Mar. 16, 1904. F. H. good. P. H. Chest injured by elevator four months before entrance. Habits: slight alcoholic excess. Pres. ill.—For seventeen days malaise, pain in right side increased by deep inspiration; gradually decreasing pain; dyspnœa for one week: slight dry cough for three weeks. Phys. exam.—W D. & N.; good color. Heart displaced to right. Lungs: left pleural effusion. Examination otherwise negative. Temperature gradually coming down to normal in ten days; pulse averaged 90; respirations 25 to 30. Blood: whites—9,200. Sputum; no tubercle bacilli. *March 16th, chest tapped, fluid*: amount 44 oz., greenish yellow, slightly opalescent, moderate coagulum; alb. 3%, sp. gr. 1025, sed: slight, count of 275 cells, lymphocytes 96%, polynuclears 4%; few red corpuscles. Culture; no growth. Inoscopy; not sufficient clot. Pig inoculated; autopsied April 21st, 1904;

tuberculous. T. B. demonstrated. *March 20th, chest tapped again*, amount 21 oz., sed: lymphocytes 94%, polynuclears 3%, endothelium 3%. Pig inoculated; autopsied April 28th; negative. *March 24th, chest tapped again*, amount 4 oz., sed; lymphocytes 98%, polynuclears 1%, endothelium 1%. Pig inoculated; autopsied May 13th; negative. Diagnosis from fluid: primary tuberculous pleurisy. Patient gradually improved, and was discharged much relieved Mar. 29th. Clinical diagnosis: pleurisy with effusion. On May 24th patient returned to O. P. D. with reaccumulation of fluid in chest. Chest tapped, dirty, yellowish, thin pus withdrawn, no odor, no growth on blood serum, but had digestive action. On cover-slip few organisms morphologically resembling pneumococci and streptococci; no tubercle bacilli found. Pig inoculated with pus died in two days; negative.

Case 15.—P. D., 19, s, Italian, laborer, July 31, 1903. F. H. good. P. H. negative. Habits: moderate alcoholic, excess at times. Pres. ill.—For two weeks malaise, soreness and pressure in left chest; slight cough; no sputum. Phys. exam.—W D. and N. face flushed; heart displaced to right. Lungs: left pleural effusion; examination otherwise negative. Temperature normal or subnormal most of the time, first three days 99 to 101. Pulse irregular, 80 to 100; respirations averaged 25. Blood: whites—6,000. *Chest tapped, fluid*: amount 300 c.c., straw colored, slightly turbid, considerable coagulum, alb. 1%—, sp. gr. 1020, sed: count of 300 cells, lymphocytes 96.6%, polynuclears 1%, endothelium 1%, large mononuclears 1.4%; very few red corpuscles. Culture; no growth. Pig inoculated, autopsied Sept. 9, 1903; pig tuberculous. Bacilli demonstrated. Clinical diagnosis: pleurisy with effusion.

Case 16.—W. C., 11, American. (Inf. Hospt.) Sept. 1903. F. H. One brother died at 17 with phthisis. P. H. Always well. Pres. ill.—For ten days epigastric pain, loss of appetite, cough without expectoration, lassitude, loss of flesh, for two days feverish and chilly. Phys. exam.: left pleural effusion. Heart displaced to right. Poorly developed and very poorly nourished. *Sept. 21, 1903, chest tapped, fluid*: amount 27 oz., dark straw colored, much coagulum, sed: lymphocytes 96%, polynuclears 2%, large mononu-

clears 2% ; considerable number of red corpuscles. Inoscopy ; tubercle bacilli found. Pig inoculated ; autopsied Oct. 18th, negative. Diagnosis from fluid : primary tuberculous pleurisy. Clinical diagnosis : pleurisy with effusion.

Case 17. — M. L. (female) 39, m, Irish, housewife. Nov. 25, 1903. F. H. and P. H. negative. Habits good. Pres. ill. — For three weeks sharp pain in left side ; chilly sensations, dyspnœa, cough, white expectoration, feverish with night sweats, increasing dyspnœa. Phys. exam.— Well developed and slightly obese. Heart displaced to right. Lungs : left pleural effusion ; examination otherwise negative. Temperature at night averaged 102½, mornings 100, coming down to normal in the third week. Pulse averaged between 100 and 120 ; respirations 20 to 30, considerable variation. Blood : whites—14,700. *Nov. 26th, chest tapped, fluid* : amount 2 qts., straw colored, opalescent, sp. gr. 1020, sed : lymphocytes 96%, polynuclears 2%, endothelium 2% ; marked number of red corpuscles. Culture ; no growth. Inoscopy : tubercle bacilli found. Pig inoculated, autopsied Jan. 5, 1904, negative. Dec. 1, 1903, fluid had re-accumulated ; left chest tapped again, amount 1 qt., character of fluid same. Diagnosis from fluid : primary tuberculous pleurisy. Dec. 16th discharged much relieved. Clinical diagnosis : pleurisy with effusion.

Case 18.—A. O. (female) 21, s, Italian, candy maker. Sept. 14, 1903. F. H. and P. H. negative. Habits good. Pres. ill.—For two weeks sharp pain in right side, dry cough, dyspnœa, diminishing pain, feverish, no chills, no anorexia. Phys. exam.—W. D. and fairly W. N. Heart displaced slightly to the left. Lungs : right pleural effusion. Physical examination otherwise negative. Temperature averaged normal ; highest 100 ; pulse averaged 90 ; respirations averaged between 20 and 25 ; 30 at entrance. Blood : whites—9,400. *Sept. 15th, chest tapped, fluid* : amount 30 oz., dark orange, considerable coagulum, sed : lymphocytes 97%, polynuclears 2%, large mononuclears 1%, red corpuscles fairly numerous. Culture : no growth. Inoscopy : tubercle bacilli found. Pig inoculated ; autopsied Oct. 13th, 1903, negative. Diagnosis : primary tuberculous pleurisy. Discharged relieved Sept. 27th. Clinical diagnosis ; pleurisy with effusion.

Case 19.—P. H., 62, Irish laborer, Mar. 16, 1904. F. H. good. P. H. unimportant. Habits good. Pres. ill.—For two weeks sharp pain in right side increased by deep inspiration; cough gradually increasing; little sputum; feverish, no chills; for one week dyspnœa; orthopnœa. Phys. exam.—W D. and N. Face and finger nails slightly cyanotic. Heart negative. Lungs: left bronchitis; right pleural effusion; examination otherwise negative. Temperature between 99.5 and 101, gradually coming down to normal in ten days. Pulse averaged 90, respirations 25 to 30. Blood: whites —6,600. Sputum: no tubercle bacilli found. *March 17th, chest tapped, fluid*: amount about 3 qts., straw colored, slight coagulum, alb. 3%, sp. gr. 1022, sed; marked amount, lymphocytes 94%, polynuclears 3.2%, mast .8%, large mononuclears 2%, marked number of red corpuscles. Culture: no growth. Inoscopy: tubercle bacilli found. Pig inoculated; autopsied May 5, 1904, negative. Diagnosis from fluid: primary tuberculous pleurisy. Patient improved remarkably after the tapping and was discharged much relieved on the 30th of March. Clinical diagnosis: pleurisy with effusion.

Case 20.—M. J. S., 16, s, Irish, errand boy. Dec. 28, 1903. F. H. good. P. H. unimportant. Habits good. Pres. ill.—For two months pain in right chest, cough and expectoration lasting two weeks. Return of pain two weeks ago aggravated by deep inspiration. Dyspnœa on exertion. Phys. exam.—W D. and N. Face flushed. Heart negative. Lungs: right pleural effusion; physical examination otherwise negative. Temperature fluctuated between normal and 103; evening temperature rarely below 100 during ten weeks stay in hospital, except for last week. Considerable wavy variation in pulse rate, average about 100; respirations averaged between 20 and 25. Blood: whites—14,600. No sputum obtained. Feb. 4, 1904, signs of left pleural effusion. Cardiac displacement to right. Feb. 5th fluid had accumulated rapidly. *Chest tapped, fluid*: amount 34 oz., light straw color, considerable coagulum, alb. 2.1%, sp. gr. 1021, sed. lymphocytes 93.5%, polynuclears 4%, endothelium 2.5%; moderate number of red corpuscles. Culture: no growth. Inoscopy: tubercle bacilli found. Pig inoculated, autopsied Mar. 25, 1904,

negative. Diagnosis from fluid: primary tuberculous pleurisy. Patient slowly improved. March 9th discharged much relieved. Clinical diagnosis: pleurisy with effusion; double.

Case 21—E. W., 31, s, (colored) coal heaver. Dec. 22, 1903. F. H. and P. H. negative. Habits: slight alcoholic excess. Pres. ill.—For two weeks headache at first followed in two or three days by sharp pain in right chest increased by cough and deep inspiration. At entrance little pain, complained of gradually increasing dyspnœa. Phys. exam.—W D. and muscular. Heart: slight displacement to left. Lungs: right pleural effusion. Examination otherwise negative. Temperature ranging between normal and 100; pulse averaged 80; respirations 20. *Jan. 1st, chest tapped, fluid*: amount 62 oz., color greenish yellow, opalescent, moderate coagulum, alkaline, alb. 4%, sp. gr. 1018, sed: lymphocytes 95%, polynuclears 4%, endothelium 1%; marked number of red corpuscles. Cultures: no growth. Inoscopy: tubercle bacilli found. Pig inoculated, autopsied Feb. 15, 1904, negative. Diagnosis from fluid: primary tuberculous pleurisy. Continual improvement; discharged well on Feb. 15th. Clinical diagnosis: pleurisy with effusion.

Case 22.—O. R., 23, s, American, farmer, Nov. 23, 1903. F. H. and P. H. negative. Habits good. Pres. ill.—Pain in right side eight days aggravated by cough and deep inspiration. No expectoration; dyspnœa on exertion; chilly sensations, feverish at first. Phys. exam.—W D. & N. Heart pushed slightly to left. Lungs: sign of right pleural effusion; examination otherwise negative. Temperature did not go above 100 at any time. Pulse averaged 90, respirations 20 to 25. Blood: whites—9,900. *Nov. 28th, chest tapped, fluid*: amount 1 pint, color deep orange, considerable coagulum, alb. 2%, sp. gr. 1021, sed: lymphocytes 91%, polynuclears 2%, endothelium 2%, large mononuclears 5%; numerous red corpuscles. Inoscopy: tubercle bacilli found. Pig inoculated; autopsied Jan. 1st; negative. Diagnosis from fluid: primary tuberculous pleurisy. Improvement. Discharged much relieved Dec. 10th. Clinical diagnosis: pleurisy with effusion.

Case 23.—C. J. W., 22, s, American, street car conductor, Feb. 13, 1903. F. H. and P. H. negative. Pres. ill.—7 months ago cough, obliged to give up work since that time; 2½ months ago bloody sputum for one week. Dyspnœa and pain in left side; dyspnœa has continued since; gained three or four pounds in 7 months; night sweats for two weeks at time of hemorrhage. Temperature while in hospital did not go above 99.8. Phys. exam.—W. D. & N. Somewhat pale; physical examination negative except for signs of left pleural effusion. Pulse averaged between 90 and 100, and respirations 25. Blood: whites—9,000. *Feb. 14th, chest tapped, fluid*: amount 48 oz., straw colored, alkaline, alb. 5%, sp. gr. 1023, sed: differential count impossible; cells almost all necrotic; clumps of necrotic cells and a considerable number of necrotic lymphocytes and polynuclear leucocytes. Diagnosis from fluid: secondary tuberculous pleurisy. On the 17th signs of a pneumohydrothorax were present. On the 19th tubercle bacilli found in sputum. Clinical diagnosis: pulmonary tuberculosis. Pneumohydrothorax.

Case 24.—C. C., 23, s, Armenian, barber, April 4, 1903. F. H. negative. Habits good. P. H. "Pneumonia" five weeks ago lasting two weeks. Pres. ill.—Has gained strength since the "pneumonia," no pain but heavy feeling in right chest which has steadily increased, with increasing dyspnœa and sense of epigastric fulness; occasionally dry cough. Phys. exam.—W D. & N. Cardiac displacement to the left; physical examination otherwise unimportant except for a marked right pleuritic effusion. Temperature normal throughout stay in hospital. Blood: whites—12,400. *April 4th, chest tapped, fluid*: amount 67 oz., straw colored, alkaline, alb. 5.6%, sp. gr. 1023, sed: entirely broken down leucocytes, most of them containing fat drops; cells are so necrotic that varieties cannot be distinguished; occasional red blood corpuscle. Pig inoculated; autopsied May 14, 1903; pig tuberculous. Tubercle bacilli demonstrated. Cultures: no growth. Diagnosis from fluid: secondary tuberculous pleurisy. April 6th tubercle bacilli found in sputum. Discharged relieved April 10th. Clinical diagnosis: phthisis pulmonalis. Pleurisy with effusion.

Case 25.—M. K., 48, m, English, painter, July 24, 1903. F. H. Tuberculous. Habits good. P. H. Cough and night sweats for short time six months before entrance. Pres. ill.—For three months pains principally in left chest on deep inspiration; slight cough, with whitish expectoration; loss of flesh and anorexia. Phys. exam.—W D. & fairly W N. Heart: moderate displacement to the right. Lungs: left pleural effusion; signs of left apical phthisis. Physical examination otherwise negative. Temperature averaged between 100 and 102, pulse between 90 and 100, respirations 25. Blood: whites—20,700. *July 25th, chest tapped, fluid*: amount 34 oz., orange yellow, considerable coagulum, alb. 4%, sp. gr. 1020, sed: count of 250 cells, lymphocytes 95.6%, polynuclears 3.2%, endothelium 1.2%; numerous red corpuscles. Cultures: no growth. Pig inoculated; autopsied Aug. 24th; no tubercular lesions found. Diagnosis from fluid: primary tuberculous pleurisy. July 29th. Sputum: tubercle bacilli found. Condition remained the same; discharged relieved Aug. 4th. Clinical diagnosis: pulmonary tuberculosis. Pleurisy with exudation.

Case 26.—B., 30, m, teamster, Jan. 21, 1903. F. H. negative. Habits: alcohol in excess. P. H. doubtful specific disease. Pres. ill.—Slight cough with expectoration; no other symptoms since latter part of last winter. Last July strained himself lifting heavy object, and immediately had fit of coughing, during which he raised about a pint of blood. He kept at work, however, but the cough has increased since that time. Slight white expectoration, but no hemoptysis. Has had night sweats. Since November cough has increased, and has had extreme dyspnœa while lying on left side. Has not worked since Thanksgiving. Cough and dyspnœa prominent symptoms at entrance. Phys. exam.—Maximum temperature 100 F., below that most of the time. Signs of hydropneumothorax right chest, namely, swashing, shifting dulness and tympany. Left lung negative, except for fine rales at base. Heart displaced to left. Blood, 7,600 whites. Sputum, no tubercle bacilli found. Jan. 25th was discharged, with symptoms relieved and with signs of hydropneumothorax persisting. *Was tapped on Jan. 22nd. Fluid*: 46 oz., straw colored, sp. gr. 1022, alb. 2%. Most of cells ne-

crotic. Neutrophiles seemed to predominate, but there was a large percentage of lymphocytes. On account of the ragged and broken up condition of cells differential count very difficult. Examination for tubercle bacilli negative. June 18th, 1903, re-entry. Feeling well up to two weeks ago, since when there has been increased splashing in chest. For three weeks has had slight hoarseness and cough, no night sweats or dyspnœa. Patient states he has gained 12 pounds since last visit to hospital. Phys. exam.—W D. & N. Good color. Heart negative. Lungs: signs of right pneumohydrothorax; left lung negative; examination otherwise negative. Temperature normal. Pulse 60 to 65; respirations 20 to 25. Blood: whites—12,900. *June 19th, chest tapped, fluid*: amount 55 oz., very turbid, yellow, white sediment, sp. gr. 1023, sediment consists almost entirely of necrotic cells, lymphocytes and polynuclears. Differential not possible. Cultures: no growth. Pig inoculated; autopsied July 27th, 1903; tuberculous. Tubercle bacilli demonstrated. Diagnosis from fluid: secondary tuberculous pleurisy. May 21st discharged relieved. Sputum: tubercle bacilli present. Clinical diagnosis: pneumohydrothorax. Pulmonary tuberculosis.

Case 27.—G. S., 19, s, German, barber. Mar. 14, 1904. F. H. and P. H. negative. Habits good. Pres. ill.—For one month cough with white sputum, pain in left chest, gradual decrease of pain with onset of dyspnœa which has gradually increased. Orthopnœa and anorexia. Phys. exam.—W D. and fairly W N.; pale. Heart, slight displacement to right. Lungs: left pleuritic effusion; examination otherwise negative. Temperature below 99.5 except after tuberculin test when it rose to 103.4; pulse averaged 90 except after tuberculin test when it rose to 125; respirations between 20 and 25 except after tuberculin test when it rose to 34. Blood: whites—5,200. *March 15th, chest tapped, fluid*: amount 37 oz., straw colored, very slight coagulum, sp. gr. 1023, sed: considerable amount, lymphocytes 76.8%, polynuclears 7.2%, endothelium 14.8%, large mononuclears 1.2%; marked number of red corpuscles, many endothelial plaques. Cultures: no growth. Pig inoculated, autopsied, May 5, 1904, negative. Inoscopy: not sufficient clot. Diagnosis: from fluid: primary tuberculous pleurisy. March

31st there were signs of abdominal effusion and the patient was transferred for operation for tubercular peritonitis. Operation showed the peritoneum studded with tubercles. Clinical diagnosis: tubercular pleurisy and peritonitis.

Case 28.—W. L. H., 26, s, American, student, Sept. 30, 1903. F. H. and P. H. negative. P. H. negative except hemoptysis two years ago. Sputum; tubercle bacilli found. Remained in Colorado for a year; hemoptysis again one year ago. Six months later pleurisy with sudden onset, chilly, temperature 102 to 103, rapid pulse, dyspnœa; on about the 7th day effusion developed and *was tapped, fluid*; amount 1500 c.c., straw colored, slightly turbid, considerable coagulum, alb. 2%, sp. gr. 1019, sed: cells necrotic but lymphocytes predominate of the cells that are recognizable. Inoscopy: tubercle bacilli found. Pig inoculated, autopsied Oct. 29, 1903, negative. Diagnosis from fluid: secondary tuberculous pleurisy. Clinical diagnosis; pulmonary tuberculosis; acute tuberculous pleurisy.

Case 29.—T. McG., 25, s, Irish, tube-works, April 22, 1903. F. H. and P. H. negative. Habits good. Pres. ill.—pain in lower left chest for two weeks, decreasing in severity; dyspnœa for one week increasing. Malaise and anorexia. Phys. exam.—W D. and muscular; face flushed. Heart displaced to right. Physical examination, except for marked pleural effusion, negative. Temperature averaged normal; pulse averaged 70 to 90; respirations 20. *April 23d, chest tapped, fluid*: amount 50 oz., bloody, alkaline, alb. 4½%, sp. gr. 1021, sed: lymphocytes 93%, polynuclears 5%, endothelium 1%, large mononuclears 1%. Cultures: no growth. Pig inoculated died May 18th; autopsy negative. Diagnosis from fluid: primary tuberculous pleurisy. Discharged much relieved May 1st. Clinical diagnosis: pleurisy with exudation.

Case 30.—D. P., 18, s, Italian, mill-hand. Jan. 29, 1904. F. H. and P. H. negative. Habits good. Pres. ill.—for two weeks pain in right chest, gradually increasing dyspnœa, slight cough. Phys. exam.—W D. and N. Heart displaced to left. Lungs: large right sided effusion. Downward displacement of liver; examination otherwise negative. Temperature: considerable oscillation between 99 and 102

on the average. Pulse averaged 100; respirations between 25 and 30. Blood: whites—9,000. *Jan. 31st, chest tapped, fluid*: amount two pints, orange yellow, considerable coagulum, alb. 2½%, sp. gr. 1020, sed: count of 550 cells, lymphocytes 98%, polynuclears 1%, endothelium 1%; red corpuscles fairly numerous. Cultures; no growth. Inoscopy: negative. Pig inoculated, autopsied Mar. 7th, negative. Diagnosis from fluid: primary tuberculous pleurisy. Sputum; no tubercle or influenza bacilli found, several examinations. Gradual improvement; Mar. 16th felt perfectly well, discharged much relieved. Clinical diagnosis: pleurisy with effusion.

Case 31.—A. C., 23, Italian, laborer. Apr. 15, 1903. F. H. negative. P. H. pneumonia five years ago. Habits good. Pres. ill.—for four weeks pain in left hypochondrium increased by deep inspiration, occasional cough. For two weeks slight chills. Phys. exam.—W D. and N. Heart displaced to right. Lungs: signs of left pleural effusion. Examination otherwise negative. Temperature: considerable daily oscillation between 101 and 104, gradually coming down in the course of two weeks. Pulse averaged 90; respirations 25. Blood: whites—10,500; widal negative. Sputum; no tubercle bacilli found. *April 17th, chest tapped, fluid*: amount 1200 c.c., straw colored, considerable coagulum, alkáline, alb. 3%, sp. gr. 1021, sed: lymphocytes 99%, endothelium 1%. Cultures: no growth. Pig inoculated, autopsied May 20th, negative. Diagnosis from fluid: primary tuberculous pleurisy. May 2d discharged much relieved. Clinical diagnosis: pleurisy with effusion.

Case 32.—M. S., 39, s, American, electrical supply factory. Apr. 22, 1903. F. H. and P. H. negative. Habits good. Pres. ill. — For two weeks pain in epigastrium, gradually increasing in severity. No stomach symptoms. Dyspnœa on exertion. For two or three days slight cough without sputum; chilly sensations for two weeks. Phys. exam.—W D. and N. Heart displaced to right. Lungs: left pleural effusion. Examination otherwise negative. Temperature only once over 101, averaged between normal and 100; pulse averaged 100; respirations averaged 30. Blood: whites—6,900. *Apr. 22d, chest tapped, fluid*:

amount 1920 c.c., straw colored, very slight coagulum, alkaline, alb. 4.2%, sp. gr. 1021, sed: almost entirely lymphocytes of small variety; occasional red corpuscle. (House officer.) *Apr. 27th, chest tapped, fluid*: amount 1560 c.c., straw colored, very slight coagulum, alb. 3%, sp. gr. 1023, sed: count of 300 cells, lymphocytes 98%, polynuclears 1%, endothelium 1%, moderate number of red corpuscles. Cultures: no growth. Pig inoculated, autopsy negative. Diagnosis from fluid: primary tuberculous pleurisy. Improved rapidly; Apr. 29th discharged well. Clinical diagnosis: pleurisy with effusion.

Case 33. R. D. P., 31, s, Italian, baker. May 10, 1903. F. H. and P. H. negative. Habits good. Pres. ill.—For two weeks pain in right chest, dyspnœa, feverishness and moderate cough; these symptoms persisted to time of entrance. Phys. exam—W D. and N. Good color. Heart slightly displaced to left. Lungs: right pleural effusion; examination otherwise negative. Temperature fluctuated between 100 and 102; pulse averaged 100, respirations 25 to 30. Blood: whites—14,200. *May 10th, chest tapped, fluid*: amount four quarts, straw colored, very slight coagulum, alkaline, alb. 4%, sp. gr. 1022, sed: count of 300 cells, lymphocytes 99%, polynuclears 1%. Cultures: no growth. Pig inoculated, autopsy negative. Diagnosis from fluid: primary tuberculous pleurisy. May 14th discharged much relieved. Clinical diagnosis: pleurisy with exudation. Thickened pleura.

Case 34.—A. F., 20, s, Italian, bookbinder, Mar. 7, 1904. (O. P. D.) F. H. negative. P. H. Attacks of "grip" last four or five winters. Pres. ill.—"Grip" two weeks ago which left him with cough; no sputum; dyspnœa on exertion. Phys. exam.—Temperature 99.8. Left pleural effusion. *Mar. 8th chest tapped, fluid*: amount ½ pint, straw colored, slight coagulum, alb. 3%, sp. gr. 1022, sed: moderate amount, lymphocytes 80½%, polynuclears 17%, endothelium 1%, large mononuclears 1½%; moderate number of red corpuscles. No bacteria seen. Inoscopy: not sufficient coagulation. Pig inoculated; autopsied May 5, 1904; negative. Mar. 12, 1904, entered hospital. Phys. exam.—W D. & N. Slight cardiac displacement to right. Lungs: left pleural effusion. Examination oth-

erwise negative. Temperature did not go above 99.8; pulse averaged 85, respirations 20. Blood: whites—9,400. *Mar. 13th chest tapped, fluid*: amount not stated, straw colored, alkaline, alb. 6½%, sp. gr. 1022, sed: moderate amount, lymphocytes 91%, polynuclears 6%, endothelium 2%, large mononuclears 1%. Culture: no growth. Inoscopy negative. Pig inoculated; autopsied May 18th; negative. Diagnosis from fluid: primary tuberculous pleurisy. Patient improved. May 25th no symptoms; discharged well. Clinical diagnosis: pleurisy with effusion.

Case 35.—J. P. K., 53, m, Irish, janitor railroad station, May 14, 1903. F. H. negative. P. H. unimportant. Habits good. Pres. ill.—For four months intermittent pain in left side of chest; slight cough and expectoration. For three weeks dyspnœa, and for two weeks orthopnœa. Loss of weight. Chilly at times. Phys. exam.—W D. and fairly N. Fair color. Heart displaced to right. Lungs: left pleural effusion; bronchitis on right. Temperature fluctuated between 99.5 and 102½, gradually becoming lower; pulse slightly irregular; arterial thickening. Considerable œdema feet and legs. Blood: whites—16,000. *May 15th chest tapped, fluid*: amount 960 c.c., slightly hemorrhagic, alkaline, alb. 3.5%, sp. gr. 1018, sed: lymphocytes 97.2%, polynuclears .8%, endothelium 1.6%, large mononuclears .4%. Cultures: no growth. Pig inoculated; autopsied June 19, 1903; negative. Diagnosis from fluid: primary tuberculous pleurisy. Blood: whites—10,400. Sputum: no tubercle bacilli found; four examinations. Steady improvement; May 22nd discharged much relieved. Clinical diagnosis: pleurisy with hemorrhagic exudation. Bronchitis. Tuberculosis (?). Displaced heart with adhesions.

Case 36.—J. J. S., 30, m, American, laborer, Oct. 19, 1903. F. H. good. P. H. unimportant. Habits: tobacco to excess. Pres. ill.—For four weeks pain on deep inspiration, increasing steadily; slight cough; small amount of sputum; no chills. Phys. exam.—W D. & N. Color good. Heart negative. Lungs: right pleural effusion, slight bronchitis left lung; examination otherwise negative. Temperature 101 at entrance, falling to normal in four days. Pulse averaged 70 to 85; respirations 20. Blood: whites

—7,900. *Oct. 23d chest tapped, fluid*: amount 19 oz., straw colored, small coagulum, sp. gr. 1022, sed: lymphocytes 87%, polynuclears 10%, endothelium 1%, large mononuclears 2%; marked number of red corpuscles. Cultures: no growth. Inoscopy: negative. Pig inoculated; autopsied Dec. 6th; negative. Diagnosis from fluid: primary tuberculous pleurisy. No sputum. Steady improvement. Oct. 30th discharged much relieved. Clinical diagnosis: pleurisy with effusion.

Case 37.—H. H. P., 29, m, American, conductor, Nov. 26, 1903. F. H. negative. P. H. unimportant. Habits good. Pres. ill.—12 days malaise, headache, anorexia, for four days pain in epigastrium shifting to back, relieved by left lateral decubitus. Phys. exam.—W D. and fairly well nourished. Good color. Heart negative. Lungs: left pleural effusion. Examination otherwise unimportant. Blood: whites—11,800. Temperature 102 at entrance, falling gradually to normal on the 11th day, with the exception of one exacerbation on the 7th day. Pulse averaged between 80 and 90; respirations 20 to 25. No sputum. *Nov. 27th chest tapped, fluid*: amount 105 oz., straw colored, large coagulum, alb. 4%, sp. gr. 1020, sed: lymphocytes 96%, polynuclears 3%, endothelium 1%; moderate number of red corpuscles. Cultures: no growth. Inoscopy: negative. Pig inoculated; autopsied Jan. 1, 1904; negative. Diagnosis from fluid: primary tuberculous pleurisy. Steady improvement. Dec. 8th discharged well. Clinical diagnosis: pleurisy with exudation.

Case 38.—A. A. C., 11, s, American, school, Jan. 29, 1904. F. H. good. P. H. unimportant. Habits good. Pres. ill.—For two months gradually increasing malaise and cough; no sputum; no dyspnœa. Phys. exam.—W D. and fairly W N.; slightly pale. Heart negative. Lungs: signs of right pleural effusion. Examination otherwise negative. Temperature remained below 100 most of the time, but on several occasions it reached 101 and over. Pulse rate irregular in waves, averaging about 90; respirations averaged between 25 and 30. Blood: whites—6,700. No sputum. *Jan. 30th chest tapped, fluid*: amount 34 oz., considerable coagulum, sed: count of 300 cells, lymphocytes 98%, endothelium 1%, large mononuclears

1% ; moderate number of red corpuscles. Inoscopy: negative. Pig inoculated; autopsied Mar. 8, 1904; negative. Cultures: no growth. Diagnosis from fluid: primary tuberculous pleurisy. Gradually improved; Feb. 27th discharged much relieved. Clinical diagnosis: pleurisy with effusion.

Case 39.—A. J. D., 49, m, American, sign painter, Mar. 29, 1904. F. H. negative. P. H. unimportant. Habits good. Pres. ill.—For five weeks has noticed growth of lumps in neck, axillæ and groins; has lost color and strength. Abdominal distension, wheezing in chest, no cough, dyspnœa. Phys. exam.—W D. and fairly W N. Marked enlargement of glands in axillæ, groins and neck. Heart negative. Lungs: left pleural effusion; signs of slight effusion at right base. Abdomen, no signs of ascites. Hepatic and splenic enlargement; slight œdema both legs. Temperature not above 99.8; pulse averaged 90; respirations 20 to 25. Blood: whites—711,900; reds—3,020-000; hemoglobin 20%. Differential count of 500 cells showed 500 lymphocytes. *April 4th left chest tapped, fluid*: amount 16 oz., orange yellow, very slight coagulum, alb. 4%, sp. gr. 1018, sed: marked amount, count of 300 cells, lymphocytes 95%, polynuclears 1%, endothelium 1.4%, large mononuclears 2.6% ; marked number of red corpuscles. Cultures: no growth. Inoscopy: not sufficient coagulation. Pig inoculated; autopsied May 21, 1904; negative. Diagnosis from fluid: primary tuberculous pleurisy. Mar. 9th discharged unrelieved. Clinical diagnosis: lymphatic leukemia. Died April 23rd. Autopsy: lymphatic leukemia. Chronic left pleuritis.

Case 40.—M. P. McC., 32, s, English, Mar. 25, 1904. F. H. Mother and two sisters died with chest symptoms, suggestive of tuberculosis, within 18 months. P. H. negative. Habits: periodical alcoholic excess. Pres. ill.—For three weeks pain in right side, increased by deep inspiration. Cough; marked morning expectoration. Occasional chilly sensations. Night sweats. Increasing dyspnœa with diminution of pain. Phys. exam.—W D. and N. Color good. Heart negative. Lungs: right pleural effusion; examination otherwise negative. Temperature 103, gradually falling in the course of two weeks, and then averaging be-

tween 99 and 100. Pulse averaged 90; respirations 25 to 30. Blood: whites—7,200. Sputum: no tubercle bacilli found on repeated examinations. *Mar. 30th chest tapped, fluid*: straw colored, slight coagulum, sed: slight, lymphocytes 92%, polynuclears 8%, few red corpuscles. Cultures: no growth. Pig inoculated; autopsied May 18th, negative. Inoscopy: too little clot. Diagnosis from fluid: primary tuberculous pleurisy. Patient improved steadily; discharged Apr. 15th, much relieved. Clinical diagnosis: pleurisy with effusion.

Case 41.—L. C. (female) 30, m, American, housewife. Mar. 19, 1903. F.H. negative. P.H. unimportant. Habits good. Pres. ill. —Two weeks ago, eight days after birth of child, taken with fever and headache, slight cough, pain in right chest, worse on deep inspiration. Phys. exam.—W D. and N. Color good. Heart negative. Lungs: right pleural effusion. Abdomen negative. Temperature chart very irregular with large diurnal excursions of the temperature. At the end of a month temperature averaged normal with slight evening exacerbations, always below 100. Pulse chart irregular roughly following the temperature; respirations averaged below 30, on several occasions, however, reaching 40. Blood: whites—7,400. Sputum, small amount; no tubercle bacilli. *March 19th chest tapped, fluid*: amount 200 c.c., alb. 3.6%, sp. gr. 1021, sed: lymphocytes 94%, polynuclears 1%, endothelium 2%, large mononuclears 3%. Cultures: no growth. Pig inoculated, autopsied Apr. 18, 1903, negative. Diagnosis from fluid: primary tuberculous pleurisy. Slow improvement; April 24th discharged well. Clinical diagnosis: pleurisy with effusion.

Case 42.—C. G. (female) 30, s, Italian, farm laborer. June 2, 1903. F. H. and P.H. not taken. Pres. ill.—Sick for two weeks, pain, cough, chills and fever, dyspnœa. Phys. exam.—W D. and N. Good color. Heart negative. Lungs: left pleural effusion. Examination otherwise negative. Temperature at entrance 100, after that not above 99.5 at any time. Pulse 110, after the tapping averaged between 90 and 100; respirations 40, after tapping between 25 and 30. Blood: whites—9,000. *Chest tapped, fluid*: amount 1920 c.c., straw colored, considerable coag-

ulum, alb. 3%, sp. gr. 1022, sed: lymphocytes 90.4%, polynuclears 9.6%; few red corpuscles. Cultures: no growth. Pig inoculated, autopsied July 18, 1903, negative. Diagnosis from fluid: primary tuberculous pleurisy. Fluid re-accumulated in left chest and 48 oz. were removed on June 12th. Patient had been up and about the ward for five days and was discharged much relieved June 13th. Clinical diagnosis: pleurisy with exudation.

Case 43.—M. T. (female) 40, m, Russian, housewife. July 11, 1903. F. H. and P. H. negative. Habits good. Pres. ill.—For three weeks pain in right chest on deep inspiration, pain gradually increasing until one week ago. For one week cough with slight white expectoration, pain diminishing with onset of palpitation and dyspnœa which gradually increased. Orthopnœa. Phys. exam.—W D. and N. Some pallor. Heart negative. Lungs: right pleural effusion. Examination otherwise negative. Temperature for two days between 99.5 and 100, otherwise normal. Pulse for five days between 90 and 100, after that between 70 and 80; respirations 30 to 35 for a week, then between 20 and 30. Blood: whites 5,400. Sputum; no tubercle bacilli found. *Chest tapped, fluid*: amount 60 oz., straw colored, considerable coagulum, alb. 1.3%, sp. gr. 1020, sed: lymphocytes 96%, polynuclears .8%, endothelium 2.4%, large mononuclears .8%; marked number of red corpuscles. Cultures: no growth. Pig inoculated, autopsied Aug. 13th, negative. Diagnosis from fluid: primary tuberculous pleurisy. Patient improved steadily and was discharged much relieved July 24th. Clinical diagnosis: pleurisy with effusion.

Case 44.—B. C. C. (female), 22, s, Canadian, waitress. Feb. 17, 1904. F. H. good. P. H. negative. Habits good. Pres. ill.—For five or six weeks sharp pain in side coming on in sudden attacks, lasting a few moments. Pain diminished, cough developed, headache, malaise, dyspnœa. Phys. exam.—W D. and N. Pale. Heart negative. Lungs: right pleural effusion. Examination otherwise negative. Temperature at entrance 103, gradually falling to normal at the end of three weeks. Considerable diurnal variation with elevated evening temperature. Pulse 100 gradually falling to 80; respirations 20 to 25. Blood:

whites—5,600, Widal negative. No sputum. *Feb. 19th chest tapped, fluid*: amount 64 oz., straw colored, slight coagulum, sp. gr. 1020, sed: lymphocytes 92%, polynuclears 5%, endothelium 1%, large mononuclears 2%; marked number of red corpuscles. Cultures: no growth. Inoscopy; too little coagulation. Pig inoculated, autopsied Mar. 25, 1904, negative. Diagnosis from fluid: primary tuberculous pleurisy. Patient gradually improved and was discharged much relieved Mar. 16th. Clinical diagnosis: pleurisy with effusion.

Case 45. — Miss X, 37, American, professional nurse. F. H. good. P. H. She had nursed tuberculous case for seven months up to six months ago and for the last year, when off duty, she has slept in a room which was formerly occupied by a tuberculous nurse. A year ago physical examination showed a healthy woman. Feb. 29, 1904, consulted her physician on account of the following symptoms: For ten days had pain on deep inspiration in the right chest, disappearing in a few days. It returned, however, in four or five days with increased severity. Morning temperature was 100, some cough, loss of appetite. Phys. exam.—showed a pleural effusion. Temperature 102, remained at that level for about three weeks. *Mar. 5th chest tapped, fluid*; amount 16 oz., color deep orange, slight coagulum, alb. 2%, sp. gr. 1020, sed: moderate amount, count of 300 cells, lymphocytes 89 1-3%, polynuclears 5 2-3%, endothelium 3 1-3%, large mononuclears 1 2-3%. Cultures: no growth. Inoscopy; negative. Pig inoculated, autopsied Apr. 18th, negative. Diagnosis from fluid: primary tuberculous pleurisy. Patient made a slow recovery. Clinical diagnosis: tubercular pleurisy with effusion.

Case 46.—Mrs. X. (District case.) Woman about 60 years old, Irish, housework. Apr. 17, 1903. F. H. One son with whom she lived, died recently of phthisis. Pres. ill.—Slight cough for three months; for about ten days had pain in the chest gradually diminishing; dry cough, increasing dyspnœa, and anorexia. Pale; slight cyanosis. Somewhat emaciated. Phys. exam. — negative except for left pleural effusion. *Chest tapped, fluid*: amount about 1½ pints, reddish yellow, alb. 3½%, sp. gr. 1021, sed: almost

exclusively lymphocytes, rare endothelial cell and few large mononuclears. Many red corpuscles. Pig inoculated, autopsy negative. Diagnosis from fluid: primary tuberculous pleurisy. Clinical diagnosis: pleurisy with effusion.

Case 47.—X, 39, m, American, physician. Dec. 30, 1903. F. H. good. P. H. Twelve years ago injury to right chest; eight years ago pleurisy with effusion left chest. Tapped. Habits good. Pres. ill.—Three weeks malaise, slight cough, no sputum, increasing dyspnœa, no pain. Phys. ex.— W. D. and N., color good, heart negative. Lungs: signs of right pleural effusion; examination otherwise negative, Temperature irregular, averaging 99 to 102; pulse 90 to 100; respirations 25 to 35. No blood count made. *Chest tapped, fluid*: amount two pints, dark straw colored, alb. 2½ %, sp. gr. 1022, sed: count of 500 cells, lymphocytes 95%, polynuclears 1.6%, endothelium 1.8%, large mononuclears 1.6%; red corpuscles fairly numerous. Inoscopy negative. Pig inoculated, autopsied Feb. 15, 1904, negative. Diagnosis from fluid: primary tuberculous pleurisy; clinical diagnosis: pleurisy with effusion, probably tuberculous.

Case 48.—J. L. B., 9, s, American, school, May 12, 1903. F. H. & P. H. negative. Pres. ill.—2 weeks ago injury to left side, since when there has been pain in the left chest and abdomen, increased by deep inspiration. No cough, no chill, dyspnœa since beginning of illness; headache. Phys. exam.—W D. & N.; good color. Heart not displaced. Lungs: signs of left pleural effusion. Examination otherwise negative. Temperature not higher than 101.8, most of the time below 100; pulse averaged between 100 and 110; respirations 25 to 30. Blood: whites—10,500. *May 15th chest tapped, fluid*: amount 480 c.c., dark straw colored, slightly turbid, alkaline, alb. 5½%, sp. gr. 1022, sed: lymphocytes 95.2%, polynuclears 3.2%, eosinophiles .4%, endothelium 1.2%; red corpuscles fairly numerous. Pig inoculated died in two days; no cause for death found. Diagnosis from fluid: primary tuberculous pleurisy. Continued improvement; May 21st discharged well. Clinical diagnosis: pleurisy with exudation.

Case 49.—M. C., 33, m, meat handler, July 28, 1903. (O. P. D.) F. H. negative. Pres. ill.—For three months cough, considerable white sputum, dyspnœa. Phys. exam. —Heart not displaced. Lungs: signs of left pleural effusion. *July 30th chest tapped, fluid*: amount 1 qt., straw colored, turbid, sediment consists of broken down lymphocytes and polynuclears, difficult to differentiate elements. Numerous red corpuscles. Cultures: no growth. Pig inoculated; autopsied Sept. 11th; negative. Diagnosis from fluid: secondary tuberculous pleurisy. Clinical diagnosis: pleural effusion.

Case 50.—F. C., 68, w, Italian, Dec. 6, 1903. F. H. and P. H. negative. Habits unimportant. Pres. ill.—Cough and dyspnœa, with œdema of feet and ankles, for four months. Phys. exam.—W D. & fairly W N. Lips and ears slightly cyanotic. Pulse tension increased. Palpitation and tortuous artery. Lungs: left pleural effusion. Œdema of feet, legs and thighs; temperature sub-normal; pulse averaged about 90; respirations 20 to 25. Blood: whites—9,500. *Dec. 7th chest tapped, fluid*: amount 3 pints, color light orange, slight coagulum, sp. gr. 1015, sed: count of 500 cells, lymphocytes 97%, polynuclears 1-5%, endothelium 2%, large mononuclears 4-5%; considerable number of red corpuscles. Cultures: no growth. Inoscopy: negative. Pig inoculated; autopsied Jan. 16, 1904; negative. Diagnosis from fluid: primary tuberculous pleurisy. Continued improvement. Discharged much relieved Dec. 15th. Clinical diagnosis: myocarditis.

Case 51.—C. S. H., 29, m, American, clerical work, Feb. 2, 1903. F. H. and P. H. negative. Habits good, except for occasional alcoholic excess. Pres. ill.—Three days before entrance had chill, nausea, headache, pain in left lower chest, feverish, cough, dyspnœa. Phys. exam.—Well developed and nourished; otherwise negative, except for patch of pneumonia at the right base behind. Temperature between 103 and 105 for four days after entrance, followed by crisis. Sputum: typical pneumonia. Blood: whites—15,000. *Feb. 14th right chest tapped, fluid*: amount 20 oz., slightly hemorrhagic, alkaline, alb. 4%, sp. gr. 1019, sed: lymphocytes 65%, polynuclears 28%, eosinophiles 2%, endothelium 2%, large mononuclears 3%.

Feb. 16th hemorrhagic fluid again withdrawn; lymphocytes 80%, polynuclears 17%, endothelium 1%, large mononuclears 2%. Cultures: no growth. Pig inoculated died in three days; no cause for death found. Diagnosis from fluid: primary tuberculous pleurisy. Case discharged well from hospital Mar. 2, 1903. Clinical diagnosis: bilateral pneumonia and pleurisy with exudation.

Class II.

Case 52.—W. B., 59, m, Irish, coachman, Feb. 14, 1903. Previously been treated in hospital for aortic regurgitation. Pres. ill.—Partially broken compensation for four months. Phys. exam.—W D. and somewhat emaciated. Heart enlarged; signs of myocarditis. Lungs: signs of a moderate pleural effusion right base. Slight œdema both lungs. Temperature not elevated; sub-normal part of the time. Blood: whites—12,600. *Feb. 15th chest tapped, fluid*: amount 26 oz., slightly hemorrhagic, alkaline, alb. 2%, sp. gr. 1017, sed: polynuclears 52%, lymphocytes 39%, endothelium 4%. Many of the polynuclears show diplococci resembling pneumococci. Many red blood corpuscles. *Chest tapped again* on the 19th; fluid approximately the same as on the 15th. Cultures: no growth. Sputum: typical pneumonia. Patient's condition remained without improvement, and was discharged, dead, on March 12th. Clinical diagnosis: endocarditis. Right pleural effusion. Autopsy showed aortic endocarditis, hemorrhagic infarction of the lungs with invasion of portions by the pneumococcus with resulting consolidation.

Case 53.—D. C., 28, s, Italian, laborer, June 20, 1903. F. H. P. H. Habits unimportant. Pres. ill.—Three weeks (?) sick with cough, fever and pain in right chest, chills at onset. Phys. exam.—W D. and fairly W N.; expression anxious. Heart negative. Lungs: pneumonia right upper lobe. Temperature averaged about 103 for two weeks, 102 for two weeks, and then 100.5. Pulse averaged 120; respirations averaged 30 to 35. Blood: whites 46,400. Sputum: muco-purulent, greenish, many influenza bacilli. *July 6th right chest tapped, fluid*: amount 3 oz., cloudy, straw colored, considerable coagulum, sed: large amount, muco-purulent; polynuclears 97%, lymphocytes

2%, endothelium 1%. Count of 300 cells; most of cells necrotic, but easily recognizable; organisms resembling pneumococci seen. Cultures: pure growth pneumococcus. On blood ager no influenza bacilli. Patient apparently improved and signs of fluid diminished, but on July 20th signs of re-accumulation of fluid appeared, and on the 22nd right back was tapped and pus withdrawn. Pus slightly greenish; cultures pure pneumococcus. Transferred surgical. Discharged relieved Aug. 6th. Clinical diagnosis: influenza pneumonia. Empyema.

Case 54.—E. W. N., 18, s, American, chemist, May 8, 1903. F. H. & P. H. negative. Habits excellent. Pres. ill.—7 days ago with sudden onset, chill, headache, fever and delirium, vomiting, cough, and bloody sputum, pain in right side, dyspnœa. Phys. exam.—W. D. and fairly W. N. Color good. Heart negative. Lungs: pneumonia right lower lobe. Temperature between 102 and 103½; pulse averaged 100, respirations 30. Blood: whites —32,400. *May 13th chest tapped, fluid*: amount 390 c.c., yellowish, cloudy, turbid, alkaline, alb. 3%, sp. gr. 1018, sed: somewhat necrotic pus, polynuclears predominating; lymphocytes few, eosiniphiles rare, with moderate number of cocci seen, some of them intracellular. Cultures: pure pneumococcus. Pig inoculated died in four days; autopsy negative. 3 cover-slip preparations examined for tubercle bacilli, negative. May 21st chest tapped, 6 oz. of pus withdrawn. Pus culture pneumococcus. Transferred surgical for operation. Clinical diagnosis: lobar pneumonia. Pleurisy with effusion.

Case 55.—T. T., 34, m, American, laborer, May 13, 1903. (O.P.D.) F. H. good. P. H. unimportant. Habits: alcohol to excess up to 3 months ago. Pres. ill.—Came to the hospital May 12th for relief of stomach symptoms. Sept. 12, 1903, complained of pain in left chest. Physical examination showed left pleural effusion. Temperature 100.2. Examination of heart and lungs in May negative. *Chest tapped Sept. 12th, fluid*: straw colored, moderate coagulum, sed: count of 500 cells, polynuclears 58.6%, lymphocytes 38%, eosinophiles .4%, endothelium 1%, large mononuclears 2%; moderate number of red corpuscles. Cultures: no growth. Pig inoculated; autopsied

Oct. 12th; negative. Inoscopy negative. Clinical diagnosis: pleurisy with effusion.

Case 56.—J. G., 43, m, Scotchman, farmer, July 29, 1903. F. H. good. P. H. negative. Habits good. Pres. ill.—Three weeks ago struck by heavy hook used for lifting hay, resulting punctured wound of right side. In bed since; dyspnœa, pain; wound healed within a week. Slight cough for few days. Phys. exam.—W D. & N. Color good. Heart negative. Lungs: right pleural effusion. Examination otherwise negative. Temperature at entrance 101, falling in the course of five days to normal. Pulse averaged 80, respirations 20 to 25. Blood: whites—13,000. *July 30th, chest tapped, fluid*: amount 70 oz., slightly turbid, alb. .6%, sp. gr. 1019, sed: count of 305 cells, polynuclears 57.6%, lymphocytes 31.2%, eosinophiles .5%, endothelium 4.2%, large mononuclears 6.5%. Cultures: no growth. No sputum. Aug. 5th chest tapped, amount 18 oz., alb. 1%, sp. gr. 1013. Steady improvement. Aug. 11th discharged much relieved. Clinical diagnosis: traumatic infectious pleurisy.

Case 57.—H. G., 19, s, Austrian, mattress-maker, Jan. 6, 1904. F. H. good. P. H. unimportant. Habits good. Pres. ill.—4 weeks ago taken sick with chills, headache, malaise, no cough. Was in Boston City Hospital 12 days when he returned home, and 2 days later was taken sick again with increase of pain, particularly in the joints. Dyspnœa. Phys. exam.—W D. and fairly W N. Slightly pale. Heart: signs of mitral and aortic disease. Lungs: signs of pneumonia; patch left base. Examination otherwise negative, except for rapid respiration. Temperature chart up to time of his death not remarkable. Pulse continually 100 and over, with few exceptions. Respiration chart extremely irregular, for the most part higher than 35. Blood: whites—15,800. Sputum typical of pneumonia; no tubercle baccilli. Patient developed left pleural effusion. *Jan. 14th, chest tapped, fluid*: color orange, considerable coagulum, alb. 2%, sp. gr. 1018, sed: count of 510 cells, polynuclears 50%, lymphocytes 34%, eosinophiles ½%, endothelium 13%, large mononuclears 2½%; considerable number of red corpuscles. Cultures: no growth. Blood: whites—17,700. Patient's condition fluctuated until

death finally took place on April 19th. Clinical diagnosis: malignant endocarditis. Pneumonia. Pleurisy with effusion.

Case 58.—L. H. H., 22, s, American, conductor elevated railroad, Mar. 7, 1904. F. H. good. P. H. unimportant. Habits good. Pres. ill.—12 days before entrance caught cold; one week ago cough, pain in left side, dyspnœa, for two days chilly sensations; pain, heat and swelling in ankles, knees and shoulders. Phys. exam.—W D. and N. Good color. Heart: signs of endo and pericarditis. Lungs: signs of consolidation at the left base with thickened pleura. Examination otherwise negative. Temperature running between 102 and 106; pulse 70, gradually rising to 120. Respirations averaged about 30, gradually rising to 55. Blood: whites—16,800. Sputum that of pneumonia. Patient developed signs of fluid at the left base. *March 18th, chest was tapped, fluid*: orange color, slightly turbid with fibrin flakes and clots; alb. 3%, sp. gr. 1020, sed: abundant; count of 500 cells, polynuclears 82.6%, lymphocytes 9.2%, eosinophiles .4%, myelocytes .4%, endothelium 5%, large mononuclears 2.4%; moderate number of red corpuscles. No organism seen on cover slip. March 19th: Blood: whites—22,000. *March 20th, left chest tapped again, fluid*: orange color, slightly turbid, one small fibrinous clot, sp. gr. 1015, sed: count of 500 cells, less by half than before, polynuclears 70%, lymphocytes 12%, myelocytes 1%, endothelium 17%; few bacteria in polynuclears. Marked increase in phagocytic endothelium. Cultures: no growth. Blood: whites—19,600. March 29th patient died. No autopsy obtained. Clinical diagnosis: lobar pneumonia. Acute articular rheumatism. Pericarditis. Pleurisy with effusion.

Case 59.—C. O. B., 47, m, Canadian, gardener, March 25, 1904. F. H. negative. P. H. unimportant. Habits good. Pres. ill.—Past winter began to have dyspnœa on exertion and swelling of legs and abdomen; severe cough; sputum white. For one week increase in symptoms. Orthopnœa at times. Phys. exam.—W D. and slightly obese. Heart: signs of myocarditis. Lungs: signs of bronchitis and right pleural effusion. Temperature 103, pulse 124, respiration 40. Blood: whites—6,800. *March 26th, chest tapped, fluid*: amount 40 oz., color yellowish red,

turbid, some fibrinous flakes, alb. 1%, sp. gr. 1012, sed: considerable, count of 500 cells, polynuclears 96.6%, lymphocytes .4%, endothelium and large mononuclears 3%; few red corpuscles. Cultures: no growth on blood serum or blood ager; some digestion of the blood serum. Pig inoculated; autopsied May 31, 1904; negative. Patient transferred to surgical on March 26th. Clinical diagnosis: empyema. Myocarditis. Broken compensation. Ascites.

Case 60.—E. S. (female), 2, s, American, March 29, 1904. F. H. good. P. H. negative. Habits: tea and coffee to excess. Pres. ill.—For four days fever, slight cough, rapid respiration, thirsty. Grown rapidly pale. Phys. exam.—W D. and N.; slightly cyanotic. Heart negative. Lungs: signs of right pleural effusion and consolidation; otherwise negative. Temperature between 102 and 104. Pulse 150 to 170, falling to 138. Respiration 55, falling to 40 after tapping. Blood: whites—28,400. *March 31st, chest tapped, fluid*: amount 8 oz., brownish yellow, turbid, few fibrinous flocculi, alb. 3%, sp. gr. 1020, sediment abundant, consisting of broken down leucocytes, chiefly polynuclear; many streptococci seen; no tubercle bacilli found on cover slip. Cultures: pure streptococcus. Child was transferred to surgeons. Operated on, making an extremely slow recovery. Is still in hospital. Clinical diagnosis: pneumonia.

Case 61.—J. F. (female), 18, s, Italian, Mar. 1, 1904. F. H. & P. H. negative. Habits good. Pres. ill.—For three weeks pain in left chest with increasing shortness of breath, slight cough, no sputum. Phys. exam.—W D. & N. Face flushed. Heart displaced to right. Examination otherwise negative. Temperature 103, pulse 120, respirations 40. Blood: whites—19,600. *Chest tapped, fluid*: amount 48 oz., greenish brown, turbid, with fibrinous flakes, alb. 2%, sp. gr. 1022, sediment, considerable amount, consisting of many broken down necrotic leucocytes, mostly polynuclear; numerous cocci, many in chains without capsule. Cultures: pure streptococcus; no tubercle bacilli found; two slides examined. March 3d transferred to surgical. Operated upon several times. Very slow convalescence. Patient still in hospital, June 2, 1904. Clinical diagnosis: pleurisy with effusion. Streptococcus.

Case 62.—E. Des R. (female), 25, s, American, housework, Dec. 28, 1903. F. H. good. P. H. negative. Habits good. Pres. ill.—Three days headache, malaise, chills and fever. Sharp pain in right axilla, rigor 24 hours before entrance. Dyspnœa, increasing cough, orange colored expectoration. Phys. exam.—W D. & N. Labial herpes. Heart negative. Lungs: pneumonia right upper lobe. Examination otherwise negative. Temperature ranging between 102 and 105 for four days, then sudden drop to 100½; for two weeks temperature was irregular, between 99 and 102, then normal. Pulse closely followed temperature line, and for four days was between 120 and 140, then for two weeks averaged 110, then between 80 and 90. Respiration curve followed that of the temperature and pulse. Blood: whites—37,800. Sputum typical of pneumonia. *Jan. 4th signs of fluid in right chest, tapped, fluid*: amount 12 oz., orange colored, sp. gr. 1015, sed: polynuclears 44%, lymphocytes 34%, endothelium 8%, large mononuclears 14%; red corpuscles fairly numerous. Diplococci resembling penumococci found in polynuclears. No cultures made. Not in sterile flask. Patient developed an arthritis which delayed convalesence. Discharged well Feb. 12th. Clinical diagnosis: Croupous pneumonia. Pleurisy with effusion. Arthritis. Pneumococcus (?).

Case 63.—S. J. S., 31, m, American, painter, March 20, 1903. F. H. negative. P. H. Acute gangrenous appendix with abscess Jan. 17, 1903; operation. Otherwise negative. Habits good. Pres. ill.—For two weeks malaise, chilly feelings, sweating, symptoms gradually increasing in severity. Phys. exam.—W D. and fairly W N. Pale. Heart negative. Lungs negative. Abdomen: small discharging sinus at lower end of appendix scar, discharging a little greenish-white pus. Liver not enlarged. Spleen enlarged by percussion, not palpable: otherwise negative. Temperature irregular with evening exacerbations 100½ to 104; pulse averaged 90, respirations 25. Blood: whites—16,400; no widal. March 22, tenderness over liver region noted. March 29, transferred to surgical. May 4th, signs of right pleural effusion; question of tuberculosis of the pleura and lungs at that time. *May 5th, chest tapped, fluid*: amount 4 oz., straw colored, slightly

turbid, alb. 3½%, sp. gr. 1022, sed: polynuclears 74%, lymphocytes 2%, eosinophiles 1%, endothelium 6%, large monuclears 17%; few red corpuscles. Cultures: staphylococcus albus. Contamination? May 11th operation: abscess of the liver found pointing into pleural cavity but not rupturing. Abscess due to actinomycosis with secondary infection. October 1st discharged relieved. Clinical diagnosis: abscess ot liver due to actinomycosis.

NOTE.—Has died since leaving hospital. No autopsy.

CLASS III.

CASE 64.—M. C., 57, m, Canadian, blacksmith. April 21, 1903. F. H. and P. H. unimportant. Habits good. Symptoms of circulatory disease 3½ years ago. Phys. exam. —well developed, emaciated, somewhat pale. Heart: signs of mitral insufficiency, palpable arteries, high tension pulse. Examination otherwise unimportant except for a left pleural effusion. Extensive œdema feet and legs. Temperature approximately normal except for two days when it was 101. Respirations averaged 25. Blood: whites—11,000. Urine: normal, acid, alb. 1–8%, sp. gr. 1020, numerous hyaline, fine granular casts, few leucocytes, small round cells and blood corpuscles. *Apr. 23d, chest tapped, fluid*: amount 56 oz., straw colored, alkaline, very slight coagulum, alb. 1.2%, sp. gr. 1012, sed: many large endothelial cells occurring free and in plaques; moderate number of lymphocytes, rare polynuclears. Cultures: no growth. Patient improved under treatment; discharged relieved Apr. 9th. Clinical diagnosis: arteriosclerosis. Mitral regurgitation. Chronic interstitial nephritis.

CASE 65.—J. J. C., 48, m, Maine, bar-tender. April 28, 1903. Previously treated in hospital for aortic insufficiency. Pres. ill.—symptoms of broken compensation for six weeks. Phys. exam.—well developed and somewhat emaciated. Heart: aortic insufficiency. Lungs: signs of right pleural effusion. Abdomen: slight ascites, enlargement of the liver and spleen. Œdema of legs. Temperature averaged sub-normal; pulse averaged 90; respiration 25. Blood: whites—6,400. *April 28th, chest tapped, fluid*: amount 54 oz., pale serous, straw colored, alkaline, alb. 1.4%, sp. gr. 1012, sed: very few elements, few clumps

of endothelium and few lymphocytes. Some of free endothelium swollen and evacuolated. Cultures: no growth. Discharged much relieved May 13th. Clinical diagnosis: aortic insufficiency. Broken compensation. Enlarged liver.

Case 66.—C. W. H., 53, s, American, farmer. July 6, 1903. F. H. good. P. H. unimportant. Habits good. Pres. ill. Symptoms of cardiac disease for 2½ years. Phys. exam. W D. and N. Cyanotic. Heart: signs of mitral regurgitation and broken compensation. Lungs: signs of right pleural effusion. Considerable œdema lower extremities. Temperature normal or sub-normal with two transitory rises above 100. Pulse 65 to 85; respirations 25. Blood: whites—6,400. No sputum. *July 9th, chest tapped, fluid*: amount 52 oz., pale straw colored, very slight coagulum, alb. 1.2%, sp. gr. 1011, sed: very rare, more or less disintegrated endothelial cells. Cultures: no growth. Patient improved; July 28th discharged relieved. Clinical diagnosis: myocarditis. Mitral regurgitation. Hydrothorax.

Case 67.—F. W. C., 39, s, American, teamster. Apr. 12, 1904. F. H. negative. P. H. unimportant. Habits: alcohol to excess, up to one year ago. Pres. ill.—One month ago swelling of legs and abdomen coming on insidiously without assignable cause. Dyspnœa, no cough, anorexia. Micturates three or four times at night. Phys. exam.—W D. and poorly nourished; pale. Heart negative. Lungs: pleural effusion both bases, marked on right. Abdomen: ascites. Œdema feet, ankles, thighs and back. Temperature chart unimportant. Blood: whites—11,400. Urine characteristic of sub-acute glomerulo nephritis. *Right chest tapped, fluid*: amount 40 oz., color bright pink, coagulum very slight, alb. ½%, sp. gr. 1010, sed: marked amount principally red blood corpuscles. White elements no more numerous than the amount of blood would call for. Marked number of endothelial plaques. Cultures: no growth. Pig inoculated, autopsied May 21, negative. *April 20th, chest tapped again, fluid*: amount 48 oz., pale opalescent, no coagulation, alb. trace, sp. gr. 1008, sediment scanty, few elements. Many partly necrotic endothelial cells, some in plaques, marked number of

lymphocytes and a few polynuclears; many of cells ragged and broken up; very few red corpuscles. May 24th discharged relieved. Clinical diagnosis: sub-acute glomerulo nephritis.

Case 68.—B. L. C., 40, m, Russian, store-keeper. Apr. 18, 1904. F. H. negative. P. H. negative. Habits: tobacco to excess. Pres. ill.—For ten months increased pain in lower right chest, no other symptoms; for five weeks pain has been worse and accompanied by dyspnœa and anorexia. Phys. exam.—W D. and N., pale. Heart: slightly enlarged and irregular. Lungs: right pleural effusion. Examination otherwise negative. Temperature normal; pulse 110 at entrance, gradually falling in four days, then ranging between 70 and 85; respiration at entrance 30, gradually falling to 20. Blood: whites—10,400. *April 19th, chest tapped, fluid*: amount 42 oz., hemorrhagic, no coagulum, sp. gr. 1035, sed: large amount, chiefly red corpuscles, white elements and endothelium scanty by comparison. Endothelial plaques. Lymphocytes 23%, polynuclears 11%, endothelium 65%, large mononuclears 1%. Cultures: no growth. Pig inoculated, autopsied May 21, negative. Patient improved fairly rapidly and April 30 felt well except for occasional pain in right chest. Discharged well. Clinical diagnosis: pleurisy with effusion.

Note.—Sp. gr. was either an error of record or was due to blood, probably accidental.

Case 69.—A. B. (colored) 59. July 21, 1903. P. H. Severe rheumatism 20 years ago. Well until five months ago when he had attacks of dyspnœa and stenocardia with increasing dyspnœa; got better and was well nntil three weeks ago, since when he has had cough without sputum with increasing dyspnœa. Phys. exam.—Signs of mitral regurgitation. Lungs: signs of left pleural effusion; lungs otherwise negative. Physical examination otherwise negative. *Chest tapped July 22d, fluid*: amount 3 pts., straw colored, very small coagulum, alb. 1.2%, sp. gr. 1011, sed: many endothelial cells in large and small clumps; some of the plaques contain as many as 15 or 20 elements. Few lympocytes and rare polynuclears. Few red corpuscles. Clinical diagnosis: mitral regurgitation. Hydrothorax.

Class IV.

Case 70.—E. G. (female), 35, s, American, housework. June 18, 1903. F. H. and P. H. negative. Pres. ill.—For three years patient has had lump in the left breast which has suddenly grown larger. Progressive loss of weight. For three weeks increasing dyspnœa. Phys. exam.—P. D. & P. N. Marked dyspnœa. Heart displaced to right. Lungs: signs of large left pleural effusion. Carcinoma of the breast and metastases in the axillary and supraclavicular glands. *Chest tapped, fluid*: amount 95 oz., serous, slightly hemorrhagic, alb. 3%, sp. gr. 1022, sed: considerable number of endothelial cells free and in plaques of two and three; lymphocytes 61.7%, polynuclears 6.3%, endothelium 32%; numerous red corpuscles. Cultures: no growth. Patient died within a few hours. No autopsy was obtained. Clinical diagnosis: cancer of the breast and metastases into the pleura.

Case 71.—Mrs. X. (private patient of Dr. X). Patient had had an operation about two years ago with removal of the left breast for carcinoma. About 18 months later developed a pleurisy with insidious onset in the left side. *Fluid*: straw colored, considerable coagulum, alb. 1½%, sp. gr. 1021, sed: considerable number of endothelial cells free and in clumps, many with double nuclei and some with nuclear figures; lymphocytes 75%, polynuclears 5%, endothelium 20%. Cultures: no growth. Pig inoculated, autopsy negative. Clinical diagnosis: pleurisy with effusion, probably malignant.

Case 72.—Mrs. X. (private patient of Dr. X). Previous operation within two years for cancer of breast. *Fluid*: dark straw colored, alb. 2½%, sp. gr. 1019, sed: many lymphocytes and few polynuclears, some very large endothelial cells, some showing two nuclei, and some evacuolated. These cells occur in plaques of three and four elements and more. Case died. Autopsy showed pleura studded with cancerous nodules. Pig inoculated, autopsy negative. Clinical diagnosis: recurrent cancer of the breast with metastases into the pleura. Autopsy showed diagnosis correct.

As a result of the study of this series of cases I think we are justified in coming to the conclusion that routine and systematic examination of pleural fluids will aid us greatly in diagnosis and in determining the etiology of pleurisy.

Of the methods of which I have spoken Cyto-diagnosis is the only one which can easily be employed clinically for the reason that animal inoculation, inoscopy and culture methods can only be employed in the laboratory.

Cyto-diagnosis is not accurate in every case any more than any other clinical method, but I think I am justified in saying that it is sufficiently accurate, especially when taken in conjunction with the history and bed-side examination, and the physical and chemical properties of the fluid itself, to justify its use as a routine procedure.

As we have seen in some cases it has not only been of more than probable diagnostic value, but has given us positive and signal results.

Routine examination of pleural fluids will not only enable us to study the question of pleurisy with effusion with reference to etiology and diagnosis, but will establish a basis upon which accurate prognostic statistics can subsequently be based.

In closing I wish to thank the Visiting, Out-patient and House Staff of the Massachusetts General Hospital for their kindness in allowing me the use of these cases, and for furnishing the material upon which this paper is largely based. My especial thanks are due Dr. J. H. Wright and Dr. Oscar Richardson of the Massachusetts Hospital for many favors and valuable suggestions rendered. Additional thanks are due to Mr. Louis S. Brown for photographs and lantern slides.

PLATE I.

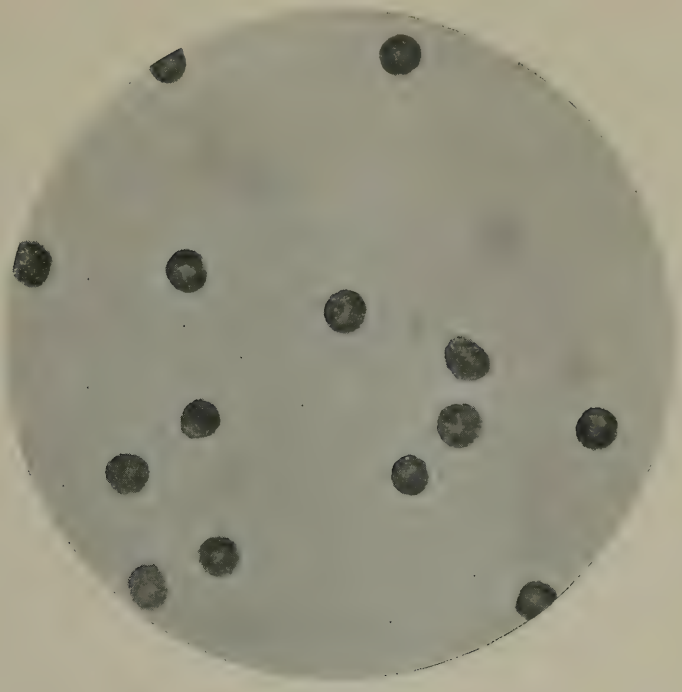


FIG. 1. — Lymphocytosis. Case of Primary Tuberculous Pleurisy. 750 diameters.

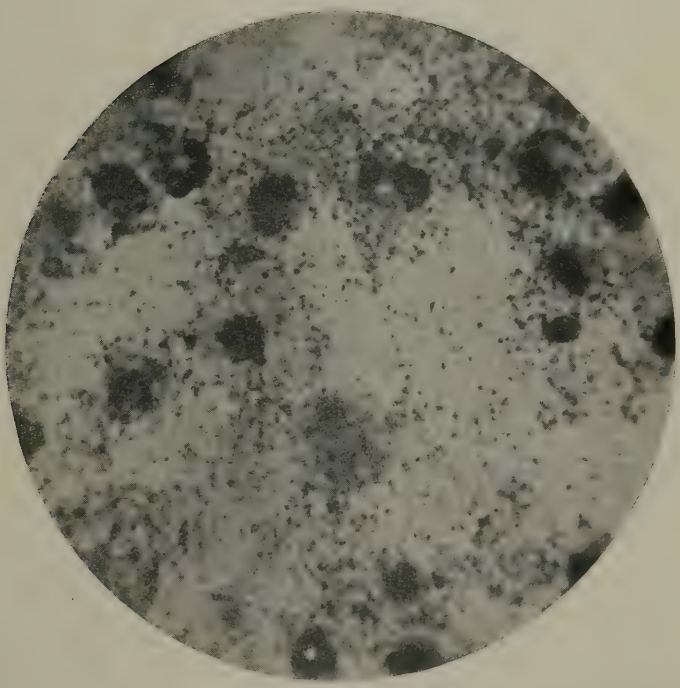


FIG. 2. — Necrotic cells and detritus. Case of Secondary Tuberculous Pleurisy. Hydro-pneumothorax. 750 diameters.

Percy Musgrave, M.D. Photos. by L. S. Brown.

PLATE II.

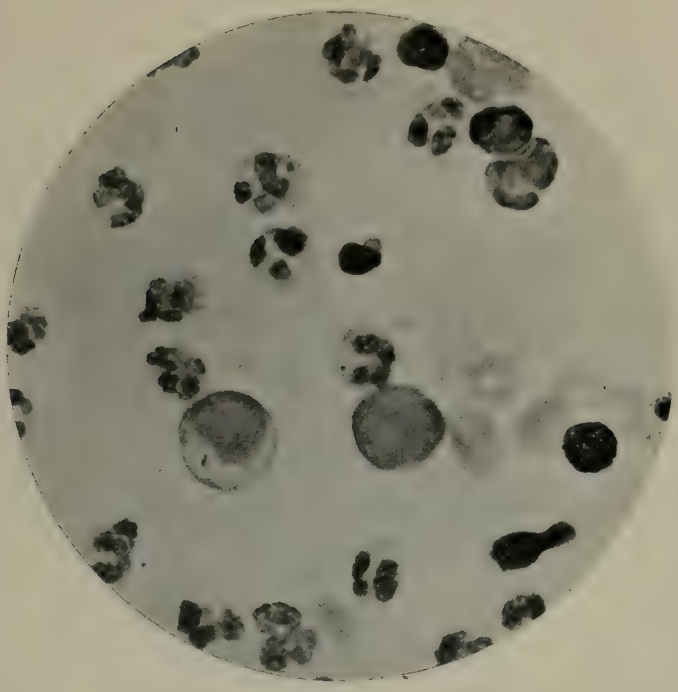


FIG. 1. — Polynuclear leucocytes and large mononuclears. Case of Traumatic Acute Infectious Pleurisy. 750 diameters.

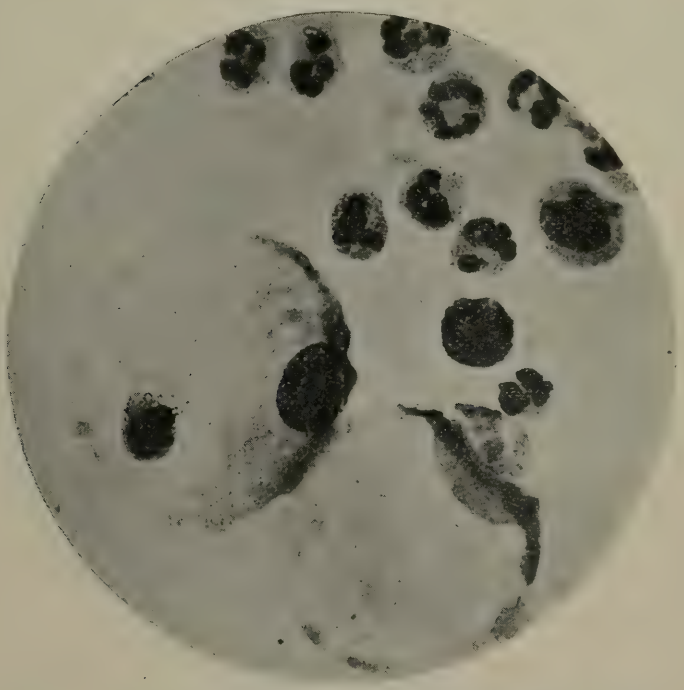


FIG. 2. — Large phogocytic endothelial cells and polynuclear leucocytes. Case of Acute Infectious Pleurisy. 750 diameters.

Percy Musgrave, M.D. Photos. by L. S. Brown.

PLATE III.

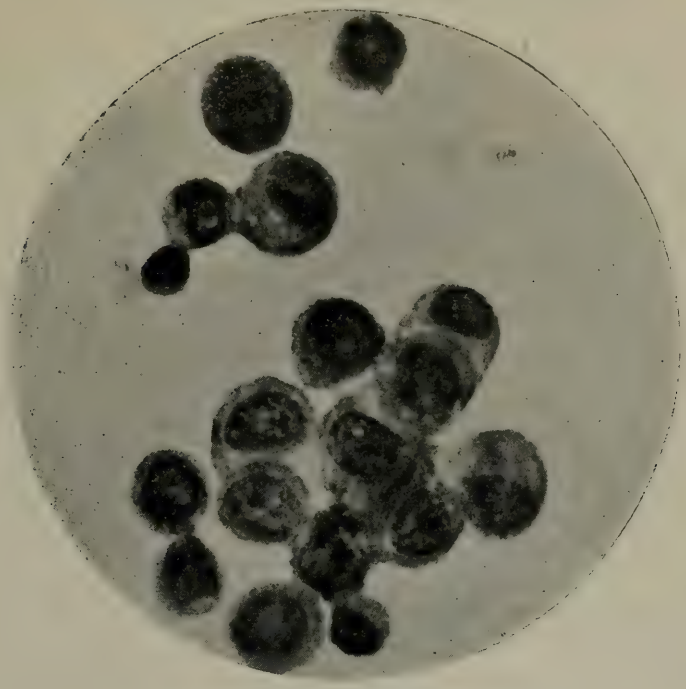


Fig. 1. — Endothelial placques and cells. Case of Hydrothorax due to cardiac disease. 750 diameters.

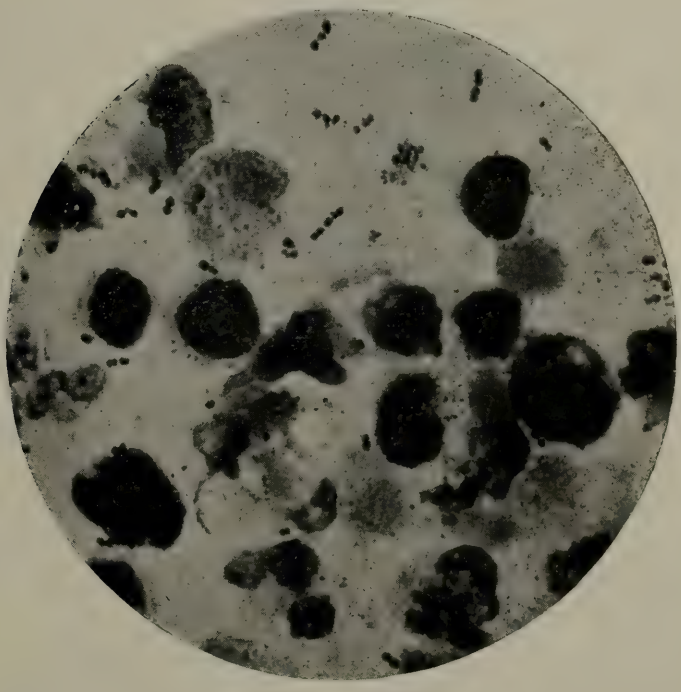


Fig. 2. — Necrotic cells and detritus with streptococci. Case of acute Streptococus Pleurisy, calling for operation. 1000 diameters.

Percy Musgrave, M.D. Photos. by L. S. Brown.

DISCUSSION.

Dr. E. A. Locke, of Boston: My experience with this method has been so limited that I have very little to add to this very complete paper. In several cases in my wards I have had an opportunity to observe the accuracy with which a diagnosis has been made by Dr. Musgrave. Of even more interest to me than its aid in diagnosis is the light which it has thrown on the question of the etiology of a large class of cases of so-called "idiopathic pleurisy." In over 50% of these, Dr. Musgrave has been able by this method to demonstrate the presence of tubercle bacilli. As the reader has said, this laboratory method, like all others, is of most value when considered with the clinical picture, for in some instances, if taken alone, its significance may be misleading. Dr. Musgrave deserves great credit for this investigation, for it is, so far as I am aware, the most thorough and exhaustive yet reported.

Dr. F. W. Gay, of Malden: Many of us hesitate about accepting some of the conclusions and discoveries which we see reported in the French medical journals. There is a flavor of absinthe about some of them; about others there is a suggestion of "the celebrated French cure," "the famous French discovery," so in the case of cyto-diagnosis, for which such extravagant claims were made at first, most of us have waited for the verification of the original work of Widal and Ravant by other observers, before attaching much importance to it as an aid to diagnosis. Now that Dr. Musgrave in his valuable paper has clearly shown its value, I think we shall all recognize cyto-diagnosis as of importance in the routine examinations. My own experience with cyto-diagnosis is limited to a series of forty cases of pleuritic fluids, which I studied two years ago, and to some thirty cases I have seen since then. I am free to confess that my results have not been so encouraging as those of Dr. Musgrave. My chief difficulty — and one which all observers have encountered — was in distinguishing the mononuclear cells. In some cases, it was very easy to say that a majority of the cells were the endothelial flakes. In others, I felt certain that a large percentage of

the cells were small lymphocytes; but in the majority of the cases of my series, I confess I could not swear that the cells were anything more than mononuclear or polynuclear. In the first few cases I examined, I fear the fact that I knew the clinical history of the case helped me in making a distinction between lymphocyte and endothelial cell. As Wolff well says, "It is much easier to talk about small lymphocytes than it is to be sure of their accurate identification." Competent observers have reported cases of tubercular pleurisy in which most of the cells were polynuclear; others, cases where the majority of the cells were endothelial flakes. In the light of these facts and my own limited experience, I do not believe that we are as yet justified in concluding from the examination of the cells in the fluid alone, whether a pleurisy is tubercular or not. Furthermore, I consider that the value of cysto-diagnosis lies entirely in its association with other clinical facts.

Dr. MUSGRAVE: I cannot agree with Dr. Gay that it is difficult to distinguish between the small lymphocytes and the endothelial cells. In the great majority of cases I have known nothing of the clinical histories until I have given my opinion as based on the examination of the fluid.

ARTICLE L.

HEART COMPLICATIONS IN DIPHTHERIA.

A CLINICAL STUDY OF 946 CASES.

By FRANKLIN W. WHITE, M.D.

AND

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OF BOSTON.

READ JUNE 7, 1904.

HEART COMPLICATIONS IN DIPHTHERIA; A CLINICAL STUDY OF 946 CASES.

This paper consists of a clinical study of nearly one thousand cases of diphtheria treated at the Boston City Hospital, South Department, during one year. We have studied mainly the condition of the heart to determine the character and frequency of heart lesions and their practical importance in prognosis and treatment. We shall present some general statistics of all the cases, taking up certain cardiac signs and symptoms which were common to large numbers of the patients, and also a special consideration of a small group of cases in which the heart symptoms were especially prominent and important.

Age.—The patients, naturally, were mostly children. Their ages were as follows:

Up to 1 year	57
From 1 to 5 years	331
From 5 to 10 years	248
From 10 to 16 years	109
Over 16 years	201

About 5 per cent. were less than one year, nearly 40 per cent. less than five years, and about 70 per cent. less than ten years old.

Sex.—The sexes were almost equally represented.

Severity.—In about one-quarter of the cases the course was mild, about one-half were moderately ill, and in one-quarter the illness was severe. Over one-half of the severe cases proved fatal, namely 132. This classification is based on the amount of toxæmia, the amount of membrane, and the presence of complications. The following table gives the number and per cent. of deaths at different ages:

	Whole No. of Cases.	No. of Deaths.	Per Cent. of Deaths.
1 year and under	57	19	33
1 to 5 years	331	43	13
5 to 10 years	248	20	8
10 to 16 years	109	6	5
Over 16 years	201	6	3

About one-half of the patients died of broncho-pneumonia, usually following operative interference such as intubation or tracheotomy. About one-fourth died of heart complications. Of the remaining one-quarter, the majority died of early severe toxæmia, and a few of asphyxia, or late paralyses.

About 50 per cent. of the patients were discharged from the hospital within four weeks, about 40 per cent. between the fourth and seventh week, only 10 per cent. remained longer than seven weeks. The length of the stay in the hospital was governed by the presence of diphtheria bacilli in the throat as well as by the severity of the illness.

Beginning of Treatment.—The hospital patients come largely from the poorer classes, where the illness is likely to be neglected at the outset and proper treatment deferred. In most of the cases treatment with antitoxin was not begun until the second or third day of the illness, and it is important to note that the large majority (at least $\frac{2}{3}$) of the severe and fatal cases averaged four or five or more days without treatment with antitoxin.

Cardiac Signs and Symptoms.—The physical signs of a greater or less degree of cardiac disturbance, such as

murmurs, and rapid and irregular pulse, were very common. Ordinary symptoms of heart disease, such as dyspnœa, dropsy, cyanosis and hemorrhage, were not common. We will take up the physical signs first on account of their far greater frequency.

Pulse Rate.—This table shows the relation between maximum pulse rates and mortality.

Pulse Rate.	No. of Cases.	No. of Deaths.	Per Cent. of Deaths.
100 or under	127	4	3
100 to 120	114	11	9
120 to 140	378	19	5
140 to 160	226	33	14
Over 160	98	49	50

About sixty-five per cent. of our cases had a maximum pulse rate of less than one hundred and forty, and the mortality among these was about five per cent. In general the higher the pulse rate the greater the mortality, as would naturally be expected. About 20 per cent. of the cases with pulse rate of one hundred and forty or over, were fatal. It is however a fact, that a prognosis from the pulse rate alone is of little value, because so much depends on the age of the patient. The pulse rate at discharge in cases which were not fatal was 100 or less in about 68 per cent., between 100 and 120 in about 31 per cent., and over 140 in five cases, or less than one per cent.

Irregularity of Pulse.—This was noted in nearly sixty per cent. of our cases, and the actual number of patients having an irregular pulse at any time may be even larger than this. It was frequently observed in severe, moderate, and even in mild cases. It was observed at the entrance to the hospital in about 12 per cent. of the patients, often combined with cardiac murmurs. In the majority of cases its time of onset was one or two weeks after entrance, and in about 35 per cent. of the cases the heart was irregular at discharge. In about one per cent. of the patients it was the first sign of cardiac disturbance observed.

It was very variable in its appearance and duration. The rhythm would often change within half an hour from marked irregularity to perfect regularity or the reverse. The duration varied greatly; some patients had only short intervals of irregularity scattered through several days, others had an irregularity which was constant for several weeks; when the patient's condition improved periods of regularity appeared or became longer, but excitement or exertion would make the pulse very irregular and rapid again. Irregular rhythm was most frequently observed in the severe and fatal cases, but Romberg's statement that irregular pulse is in general a sign of great weakness and approaching death is certainly not true.

This table gives the number of cases at different ages with irregular pulse:

Ages	1 to 5	5 to 10	10 to 16	over 16 years.
Total No. of cases	332	248	109	201
Cases with irregularity	164	189	81	66
Per cent. irregular	49	76	72	33

The statement of Villy that irregularity of the heart is much more frequent in young patients is borne out by our statistics. Irregularity of the pulse was found in two-thirds of the cases under 16 years, but in only one-third above that age. We have no explanation for the fact that irregularity of the pulse was less frequently observed in children under five than in older children, except the greater difficulty in determining the pulse rhythm at that age.

Cardiac Murmurs.—One of the most striking features of our study and the one in which it differs from most published records is the very large number of patients who were found to have heart murmurs.

The following table shows the number of patients who had heart murmurs during their stay in the hospital and at discharge, and the position of these murmurs.

Number of patients with murmurs at any time:

At apex and base	681
At apex	172
At base	25
Total number of patients with murmurs	878
Total number of patients without murmurs	53

Number of patients with murmurs at discharge:

At apex and base	433
At apex	169
At base	90
Total No. of patients with murmurs at discharge	692

All the murmurs were systolic in time with the exception of those in a few cases of chronic heart disease. A systolic murmur at the apex or base of the heart was noted in all but 53 patients, namely 94 per cent. of the cases where the condition of the heart was carefully observed and recorded. The number of cases with murmurs is probably even larger than these figures indicate, because the 53 patients recorded as having no murmurs include cases in which the heart examination was unsatisfactory, because the patient was moribund at entrance, or because the respiratory sounds due to intubation, tracheotomy or broncho-pneumonia, made it impossible to hear the heart sounds.

In view of the great number of murmurs found, it is desirable to say that these observations were confirmed in each case by two or three competent observers; that the murmurs were not doubtful or faint, or such as required change in the position of the patient to bring them out, but were, for the most part, loud and blowing in character.

In the cases having murmurs their position was at both apex and base in 77 per cent.; at the apex alone in 20 per cent.; at the base alone in about 3 per cent. To sum up, the murmurs were loud, sometimes musical, were usually

heard at the apex, frequently transmitted to the axilla, and usually associated with accentuation of the pulmonic second sound; they were not affected by change of position of the patient. The majority were associated with irregular heart action and outlasted the fever. We do not, therefore, consider them simply functional murmurs, but for the most part due to the actual changes in the heart wall or papillary muscle.

The heart murmurs developed within the first few days of illness in most cases. In 90 per cent. of the cases having murmurs, they were present at entrance to the hospital; in the remaining 10 per cent. the first note of the presence of a murmur was made within one or two weeks after entrance. These notes probably do not always represent their first appearance.

The duration was usually several weeks, at least, and in about 78 per cent. of the cases one or more murmurs were present at discharge, the relative frequency at base and apex being the same as during their stay in the hospital. The duration of the murmurs after leaving the hospital is unknown, except in a few instances. Five or six patients were examined eight or ten months after leaving the hospital, and each showed a murmur, and of these, two cases had some cardiac enlargement and irregularity with a weak first sound, indicating a probable chronic myocarditis. Many patients were seen at an interval of several weeks after leaving the hospital. In many of these cases cardiac murmurs or irregularity were found, and yet the patients were attending school and taking moderate exercise without any heart symptoms or other perceptible bad results. The authors hope to look this matter up later, to determine, if possible, the permanent effects of diphtheria upon the heart.

The mere presence of a murmur has little or no prognostic value, it is so nearly universal. The cardiac signs which are important in prognosis are gallop rhythm, rapid

and irregular pulse, cardiac enlargement, late vomiting, etc., which will be considered at length later.

The large number of children discharged from the hospital with a rather rapid and irregular pulse and cardiac murmurs is very striking, and contrasts strongly with the condition of children at the end of other acute infections, such as measles and scarlet fever, or the condition of adults at the end of such acute infections as typhoid, grippe or pneumonia, and at first sight it would seem to be very desirable to keep these patients under observation in the hospital until the heart had entirely regained its equilibrium. This matter will be considered under treatment.

The clinical course of the cases does not explain the cause of these murmurs,—it only indicates their frequency and relative importance. Pathological studies have shown that the murmurs are probably due largely to relative mitral insufficiency resulting from changes in the heart muscle or to changes in the innervation of the heart.

The first sign of cardiac disturbance was the appearance of a murmur in 89 per cent. of the patients, of a murmur combined with irregularity of the heart in 10 per cent., and of irregularity alone in 1 per cent.; these signs were present at entrance to the hospital after only a few days illness in 95 per cent. of the patients.

Cardiac enlargement was infrequent, and apart from the changes due to chronic heart disease was found only in the severe cases. We have considered the heart to be normal in size when the right border was at the parasternal line and the left border at or just outside the nipple line in children under five, and at or just within the nipple line in older children.

Seventeen of the patients had chronic heart disease at entrance to the hospital, 13 had mitral regurgitation, one mitral regurgitation and stenosis, two aortic regurgitation, and one congenital heart disease. All these patients re-

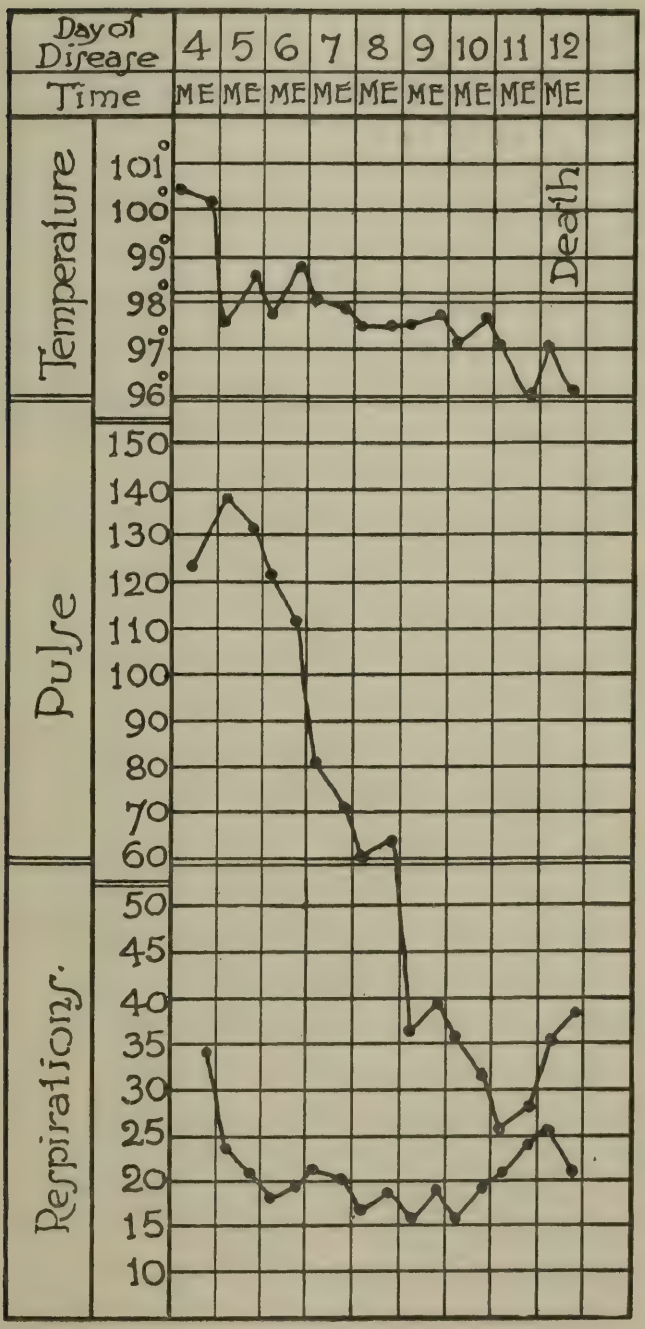
covered, and the course of the illness was no more severe than in the average patient. We could find no evidence that the heart in these patients was more susceptible to the diphtheritic poison than a normal heart. The patient with the congenital heart was two years old. He was intubed four times, had broncho-pneumonia, was in the hospital twelve weeks, but made a perfect recovery from the diphtheria, and the heart was left apparently in the same condition as at entrance.

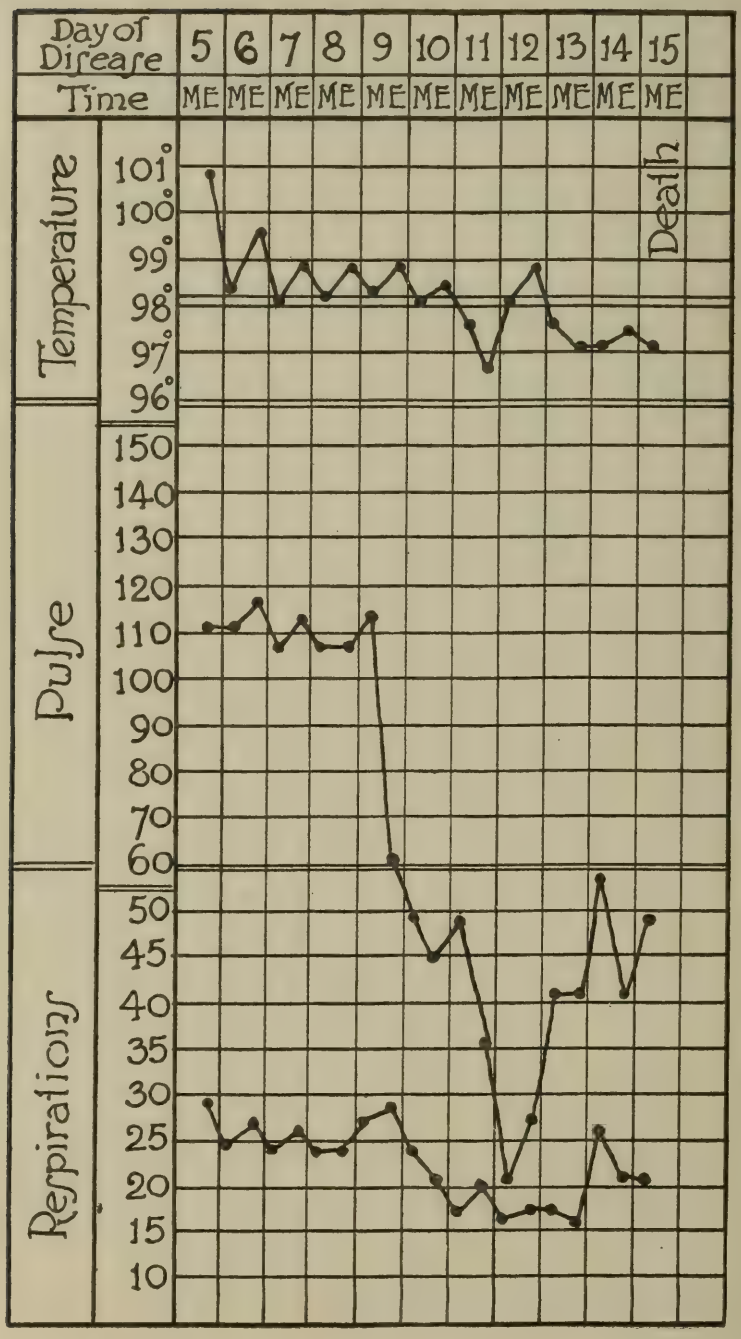
We shall now consider the small group of cases in which the heart symptoms were especially important. Some fatal cases of diphtheria are overwhelmed with poison and die in two or three days with all the symptoms of toxæmia. The serious heart complications, however, usually develop only after the second week of illness. There is no way in which one can foretell in which case such a complication will occur, but the more severe the illness and the longer without treatment, the greater the liability of its occurrence.

There are three separate types. The first and most serious type have gallop rhythm, vomiting, epigastric pain and tenderness, run a short course of two or three weeks, and die in the majority of cases. Most of our severe heart cases are of this type.

The second type lasts for weeks or months with a rapid, regular or irregular heart, easily affected by slight exertion, and gradually becoming normal in rate. As a rule, there are few other important symptoms.

The third type is rare, occurring only once in every 600 or 700 cases, its main feature is a very slow pulse occurring at the end of the second or the beginning of the third week. There is a marked decrease in rate over a period of three days, the pulse dropping from 110 or thereabouts, to 30 or even 20. Until the pulse reaches a low level (40) the subjective symptoms are slight, but when the rate gets below this there is marked prostration. The heart sounds are


Day of Disease
4 5 6 7 8 9 10 11 12
Time
ME ME ME ME ME ME ME ME ME
Temperature
101°
100°
99°
98°
97°
96°
Death
Pulse
150
140
130
120
110
100
90
80
70
60
Respirations.
50
45
40
35
30
25
20
15
10


Day of Disease
5 6 7 8 9 10 11 12 13 14 15
Time
ME ME ME ME ME ME ME ME ME ME ME
Temperature
101°
100°
99°
98°
97°
96°
Death
Pulse
150
140
130
120
110
100
90
80
70
60
Respirations
50
45
40
35
30
25
20
15
10

Respirations
Pulse
Temperature
Day of Disease
Time
Gallop Rhythm
Gallop Rhythm Absent
Tender Gland in Neck
Respiration Irregular
Respiration Irregular
Death
?

very weak, a moderate dilatation of the heart occurs; there is no vomiting. There were three such cases in our series, all fatal. These are so unusual that the charts are appended and a brief description given.

The first two illustrate the usual course in this type. In each case the disease was severe and treatment had been delayed for four or five days. The drop in the pulse rate was sudden and not accompanied by subjective symptoms until the rate was below 40; after this time a gradual dilatation of the heart occurred which continued until death. There was pallor, slight tibial œdema, marked diminution in the amount of urine which contained albumen in each case. Vomiting and epigastric pain and tenderness were not present. The patient failed gradually and death occurred a few days after the development of the bradycardia.

The third case is of especial interest. Here the pulse varied between 30 and 40 for four days. Three days later it was 120 and a well marked gallop rhythm was present, which lasted for seven days.

From this time the patient slowly improved until the sixth week, when paralysis of extremities, palate, and muscles of deglutition and respiration developed which caused his death. The striking feature of this case is the fact that the patient survived the period of bradycardia and gallop rhythm, only to die of late paralyses.

We will now outline a brief clinical picture of the group of heart cases characterized by such symptoms as gallop rhythm, vomiting, epigastric pain and tenderness.

The appearance of gallop rhythm is usually indicated by an increase in the pulse rate. The pulse may increase in frequency for a day or so, often reaching 140 or more, when the gallop appears. In other cases it appears in comparatively few hours; usually the more rapid its appearance the more serious the outlook. By the time it is well marked the pulse is 140 to 160 or more, weak and thready and often

irregular at the wrist. The gallop may continue several days and the child be apparently not much affected except for a little pallor, loss of appetite and restlessness. Rapidly increasing prostration however soon follows, and the child becomes blanched and vomiting occurs.

Vomiting is apparently unattended by nausea, anything taken by mouth is almost immediately returned, and even if no food is taken vomiting in small amounts occurs. First, yellow fluid with mucus, and later brownish material containing altered blood. About the time that vomiting occurs the child complains of epigastric pain and tenderness, and on examination well marked spasm is found. These signs are not transitory but continue until death occurs or recovery begins. Very little urine is secreted; it nearly always contains albumen. There is often slight œdema over the shins, but no general œdema. The respiration may be a little hurried but there is no dyspnœa. The heart is usually moderately dilated.

The duration of life after these symptoms have developed is usually short, one to three days. The heart is dilated, the pallor becomes extreme, vomiting becomes more frequent, the vomitus running from the child's mouth, the pulse becomes more and more rapid, the child is restless and continually cries for water which if given is immediately returned mixed with altered blood. The pulse is finally lost at the wrist and death occurs in from 12 to 48 hours. Cyanosis is absent.

In other cases the gallop rhythm continues without much effect upon the child's condition. The pulse is rapid and weak and the heart may be dilated. There is no vomiting and no epigastric pain and tenderness, the gallop gradually grows less marked and finally disappears leaving the heart weak, irregular and rapid. Exertion may cause the gallop to reappear. This condition may last from a few days to several weeks. After recovery the heart is usually rapid, weak and irregular for weeks or months.

Palatal paralysis may occur in these patients and is indicated by nasal voice and regurgitation of the food through the nose.

We will now give the statistics in the 36 cases having very serious heart complications as indicated by gallop rhythm. 19 were males and 17 females. The ages were as follows:

Under 2 years	1
Between 2 and 5 years	10
Between 5 and 10 years	15
Between 10 and 15 years	9
Over 15 years	1

Two-thirds of these patients died, one on the second day, the others on the fourth to eighth days. The effect of late treatment upon the mortality is shown by the fact that four-fifths of the fatal cases had no treatment until after the fourth day. Among the cases which recovered three-fourths were treated before the fourth day. The severity of the illness is indicated by the fact that at entrance all but two patients had a pulse of over 120 and several a pulse of 140 or over.

The first important cardiac symptom that we consider is gallop rhythm; this was found in all the cases. It appeared in one case on the sixth day, in one on the 27th, in all the others from the 9th to the 18th day. When gallop rhythm appears murmurs which usually are present become indistinguishable.

Late vomiting is the next important symptom. This occurred in about two-thirds of the cases. It was present in all but four of the fatal cases; of these four cases three died of paralysis of respiration and deglutition in the sixth to the eighth week having recovered from the gallop rhythm, leaving only one patient who died during the gallop stage and who had no vomiting. Thus we see that late vomiting was almost invariable in the fatal cases. Among the patients

who recovered, on the other hand, there was only one with gallop rhythm who had also late vomiting. In nearly every case the appearance of the gallop rhythm preceded the onset of vomiting from one to four days, occasionally longer.

The next symptom is epigastric pain and tenderness. Nine-tenths of the patients who had this symptom died; of the two who recovered one had only slight tenderness and no vomiting, the other had well marked tenderness and pain with vomiting. The time of appearance of this fatal symptom varied; it usually was closely associated in time with the appearance of vomiting, either a day or two before or a day or two after.

Palatal paralysis was noted in 19 of these severe cases, sometimes before, sometimes after the onset of heart complications; its earliest appearance being the 9th day of the illness and its latest the 17th day. It was found in ten of the fatal cases. There is difficulty in recognizing its presence in very sick patients, and it probably was present but not observed in others.

We have said enough to show that gallop rhythm, late vomiting, epigastric pain and tenderness were very frequent in severe and fatal cases, and very rare in those who recovered, which is sufficient to emphasize their importance as danger signals and their value in prognosis.

The illness of the patients who recovered was protracted, —one-third of the patients remained in the hospital six to eight weeks, one-third from eight to ten weeks, and one-third from ten to twelve weeks. During their stay in the hospital all but one had marked paralysis of legs, arms and eyes. In the fatal cases the duration of life was short, all but three died between the tenth and twentieth day of their illness, three lived from six to eight weeks; all the latter suffered from late paralyses.

The condition of these patients at discharge was interesting. Among those who recovered, two-thirds had an

irregular pulse, all but one had murmurs at the apex and base of the heart, all but one had a weak first sound, all had a rapid pulse rate, the slowest being 110. In two cases which recovered the heart was enlarged at discharge; in practically all of the fatal cases the heart was dilated.

The other signs of cardiac disturbance were not striking; sometimes there was slight œdema of the ankles and scanty urine; the respiration was rapid, averaging 35, and often irregular, especially at the latter part of the illness; there was no cyanosis. One case discharged at the end of six weeks had no paralysis; all the others had severe paralyses.

The great danger in delaying treatment with antitoxin is emphasized by the occurrence of so many serious and fatal heart complications, the likelihood of prolonged or permanent damage to the heart even in cases which recovered, and the abundant and severe post-diphtheritic paralyses, for it will be remembered that four-fifths of these fatal cases had no treatment with antitoxin until four or five days after the illness began. The cases which recovered had no treatment for at least three days, and they proved to be long, severe and dangerous.

Treatment.—It has been our experience that rest in bed and nursing are most important in the treatment of heart complications and that drugs play a small part.

Our figures show that the serious complications nearly always develop within three weeks from the onset of the illness, although in rare cases they may appear several days later.

It is usually safe to allow the mild cases to be out of bed at the end of two weeks. The presence of murmurs and a slight degree of irregularity are no contraindication if the first sound is strong and the heart is not dilated. Many of the cases severely ill, or ill several days without treatment, apparently do well for two weeks or more, the pulse may be a little irregular and rapid, but the condition of the

patient causes no anxiety. It is not, however, safe to allow these cases out of bed, even if the pulse is normal in rate and of fair strength. If four or five weeks pass, and no serious heart complications arise, the danger from this source is usually over, although death may occur from other late effects of the disease, such as paralyses of respiration and deglutition. It has been our experience that, after four or five weeks, a patient with well marked murmurs and irregular pulse, even if rapid, experiences no ill results from being allowed to sit up if the heart is carefully watched.

We will separately describe the treatment in ordinary cases,—in those with persistent rapid pulse and in those with gallop rhythm. In cases with a murmur and little irregularity the treatment is directed to improving the general condition of the child. The patient is allowed to sit up after two or three weeks of illness, but active exercise is forbidden. Digitalis and alcohol rarely do any good; strychnia is the best drug, and is given in doses of one-sixtieth of a grain every four hours for a child of five to ten years. In many cases larger doses seem to be useful, and produce no unfavorable effects.

Cases with persistently rapid pulse should be kept in bed at least four or five weeks and then allowed to sit up for short and progressively longer intervals, the heart being carefully watched on each occasion. Frequently, after four or five weeks rest in bed, the heart action is improved by this change. Strychnia seems to be the only drug of any value.

In cases with gallop rhythm absolute rest in bed is necessary, and a liquid diet is given. At the first appearance of vomiting, food should be given by rectum and cracked ice given by mouth for thirst. Strychnia in doses of one-sixtieth to one-fortieth of a grain every four hours for children three years and over is given with the best results, although drugs influence this condition but little. If there

is vomiting, the strychnia should be given subcutaneously. Cocain in doses of one-twelfth grain every four to six hours in ice cold water at times relieves the vomiting; alcoholic drugs, even champagne, are not well borne, and often increase the vomiting. Morphia in doses of one-sixteenth to one-eighth grain, depending on the age, is of value to quiet restlessness. Predigested beef products, if given in small amounts, are often retained when everything else is rejected. Hot applications to the epigastrium sometimes relieve the vomiting and pain. Digitalis is useless, and usually increases the vomiting.

Sudden deaths have occurred in our series of cases from asphyxia, but there have been no sudden deaths in the hospital from heart complications. It has occurred several times, however, that patients who have been taken out against advice about the end of the second week have died suddenly during the stage of gallop rhythm when allowed out of bed. For example, a child of three years after three weeks' stay in the hospital was taken home against advice just at the time in the illness when serious heart complications are common. A few days later the child died suddenly while being held up to the window to see some friends. This emphasizes the necessity for absolute rest in bed until all likelihood of the development of gallop rhythm has passed. The rest does not prevent the appearance of the complications but renders the outlook relatively favorable.

The cases of bradycardia require no special treatment beyond rest in bed and strychnia. Long duration of murmurs and irregularity of the heart indicate the necessity for following cases of diphtheria long after convalescence to study and prevent possible permanent changes in the heart.

The after treatment of all except the mild cases consists in watching the effect of mild exercise upon the heart for several months at least, and grading it to meet individual requirements.

The points which we especially wish to emphasize in summing up are as follows:

1. The great frequency of heart murmurs and of irregularity of the pulse. The prognosis does not depend on the mere presence of these signs, but upon the severity of the infection, the length of time without treatment, the rate and degree of irregularity of the pulse and the presence of the graver signs of cardiac disturbance.

2. Moderate disturbance of the heart is very common: severe complications are infrequent.

3. Frequent examinations of the heart are necessary to really determine its condition, because of the marked changes in rhythm from one hour to the next.

4. Gallop rhythm, late vomiting, and epigastric pain and tenderness are important as danger signals of severe heart complications. The association of late vomiting with gallop rhythm renders the outlook almost hopeless.

5. Antitoxin does not affect the heart unfavorably, but on the other hand its early use prevents the appearance of grave heart complications.

6. Frequent examination of the heart and pulse in the second and third week of the illness are necessary, that being the time when severe heart complications most frequently occur.

7. Broncho-pneumonia is a more frequent fatal complication of diphtheria than heart disease; sudden death from heart disease is very rare when patients are kept in bed for a proper period.

8. Prolonged rest in bed is necessary in all severe cases; it is not necessary to keep all patients in bed who have cardiac murmurs and a pulse which is somewhat irregular and increased in rate. One should be governed by the stage of the illness and the patient's general condition. If no serious heart trouble has developed within four weeks the patients are usually safe from this complication.

9. Heart murmurs and irregularity are of long duration in many cases and make it necessary to watch the condition of the heart long after convalescence in all severe cases.

We wish to acknowledge our indebtedness to Dr. McCollom, Medical Director of the South Department of the Boston City Hospital, for the opportunity to study these cases, and for his valuable suggestions and kindly interest in our work.

DISCUSSION.

Dr. N. P. Wood, of Northfield: I would like to ask whether or not these patients were all from the city. How many came from the country?

Dr. White.—I think they came mainly from the City of Boston.

Dr. J. H. McCollom, of Boston: All patients in the South Department come from the City of Boston. They may not be permanent residents, but they are supposed to be in Boston 24 to 48 hours.

Dr. C. F. Withington, of Boston: I think it is a pretty difficult matter to say whether these cases are due to degeneration of the pneumogastric nerve, to granular degeneration of the heart muscle, or functional nervous causes.

Dr. McCollom: I should not say that all these were cases of degeneration of the pneumogastric nerve, but a majority of them, in my opinion, were such.

ARTICLE LI.

CONCLUSIONS FROM A SERIES OF MEASUREMENTS OF BLOOD PRESSURE IN FEVERS, BEFORE, DURING AND AFTER THE ADMINISTRATION OF STRYCHNIA.

By RICHARD C. CABOT, M.D.
OF BOSTON.

READ JUNE 7, 1904.

CONCLUSIONS FROM A SERIES OF MEASUREMENTS OF BLOOD PRESSURE IN FEVERS, BEFORE, DURING AND AFTER THE ADMINISTRATION OF STRYCHNIA.

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1. The cases included in this study were all febrile. Among them were 31 cases of typhoid fever, 4 of pneumonia, and 15 others with a variety of diagnoses.

2. In 32 cases the strychnia was given by mouth, and in 18 subcutaneously. The total daily dose was usually 1-8 grain, sometimes 1-6 grain. Except in a few instances, the diet and position of the patient remained the same throughout the experiment.

3. The records were continued for days, and occasionally for weeks, before and after the drug was given, in order that the regular range of variation in the blood pressure might be ascertained.

4. The measures were taken with Stanton's modification of the Riva-Rocci instrument. The maximum pressure was recorded as the height of the mercury column at the moment of the disappearance of the radial pulse, and the minimum as the trough of the wave of greatest oscillation of the column.

5. Measurements were taken at various intervals of time succeeding the administration of strychnia, from a few minutes to several hours. The observations extended over about eight months and included over 5000 measurements.

6. The total result is negative. I have been unable to convince myself that strychnia exerts any influence upon the blood pressure of febrile cases when given in manner and dose above mentioned.

7. In the 24 hours following the administration of the drug there was a rise 5 mm. or more of pressure in 16 cases, a fall in 17 cases, and no change in 24. The average pressure in the 50 cases that received a daily dose of strychnia was no greater than in 18 cases without any drug.

8. To me one of the most striking features of the investigation was the fact that while strychnia and whiskey seemed to be entirely without influence upon the blood pressure, the sight of the dinner-tray or the prospect of getting up produced a most obvious, though transient, rise in the pressure. The only permanent gains in pressure occurred when the patient reached a crisis in pneumonia, or when convalescence enabled him to get up and walk.

9. As in the alcohol research of last year, I do not wish to be construed as saying that the drug under investigation is of no value. To prove so general a negative my work is altogether insufficient. My conclusion is, that in the dosage employed strychnia does not raise or in any way affect the maximum or minimum blood pressure so far as can be determined by the instrument employed.

DISCUSSION.

Dr. Henry Jackson, of Boston: It seems that the experiments certainly prove that, as far as we can tell, the blood pressure is not increased by the administration of strychnia. We do not know that an increase in the blood pressure is necessarily an indication of increased strength of heart.

Personally, I should be much against giving up the use

of strychnia. However, I admit that my own experiments made at the hospital have been in accord with the observations made by Dr. Cabot, but it does not make me feel that I do not care to use strychnia.

Dr. E. A. Locke, of Boston: I have been associated only in a very remote way with this investigation, and consequently cannot speak authoritatively for Dr. Cabot. There certainly can be no doubt as to the action of strychnia on the circulation. Numerous animal experimentations have shown its action on the circulation to be two-fold; first, it acts on the vaso-motor nerves, causing a constriction of the peripheral blood vessels, with a consequent rise of blood pressure, and second, the rate of the heart's action is slowed. There is every evidence that a similar action takes place in man. Personally, I believe that strychnia has a very definite action, and I doubt very much if Dr. Cabot, were he present, would deny this on the strength of his negative results with the Stanton apparatus.

ARTICLE LII.

DISEASE OF THE MYOCARDIUM.

By HENRY JACKSON, M.D.
OF BOSTON.

READ JUNE 7, 1904.

DISEASE OF THE MYOCARDIUM.

MANY large volumes have been written on the subject of valvular disease of the heart, and much discussion has taken place as to the possibility of an accurate differential diagnosis and as to the exact pathologic condition which is the cause of a certain murmur. All text-books contain many chapters on this branch of heart disease. On the other hand, diseases of the myocardium are dismissed with a short account of the rare forms of new growth which may be found in the muscular substance of the heart, and often by a rather confused account of dilatation and hypertrophy of the heart.

Practically we cannot with our present knowledge successfully apply treatment to chronic valvular diseases, or rather we cannot at any rate cure the deformities of the valves produced by chronic valvular endocarditis. In heart disease, individuals suffer only when and in proportion as the myocardium becomes involved as the result of a failure of the valves to carry on their work. This is certainly true of the cases of disease dependent upon valvular trouble, but such cases represent only a small proportion of the individuals who suffer from disturbance of the heart.

A very large number of individuals who are affected with "heart disease" have no valvular lesion. The nomenclature of non-valvular diseases of the heart is at present chaotic, and an exact diagnosis is most difficult to make, in many cases impossible. We are confronted by two possibilities in choosing the proper name for a given case; we

may choose a name according to the most prominent clinical symptom as dilatation, or mitral regurgitation, or we may choose a name based on the probable pathologic condition. The former method is certainly faulty; as to the second suggestion we are rarely in a position to decide with accuracy as to the exact pathologic lesion present in a given case. In many cases we may be reasonably sure as to the ultimate cause of the trouble, as in cases of arterio-sclerosis, yet quite in the dark as to the exact pathologic condition of the heart. A glaring proof of the futility of attempting to define the disease on the basis of the pathologic condition is found in the continued use of the term "fatty heart," though we know that fatty degeneration of the heart is rarely found to be the cause of serious chronic myocardial disease. Until further light is thrown upon the subject the name myocardial disease, or disease of the myocardium, seems open to as little objection as any other term. Myocarditis is objectionable as it signifies a condition seldom present; degeneration of the myocardium is far more common than any inflammatory process.

It seems wise to choose a generic name rather than a definite name based on pathologic findings, as the changes found are manifold. Diseases of the myocardium may be classed as acute and chronic. In most septic diseases, using the word in the wide sense of including all diseases of acute course dependent upon bacteria, we find at autopsy more or less fatty or granular degeneration of the muscle of the heart. During life this process is suggested by rapid action or by irregularity and intermittent action. I have seen in diphtheria and scarlet fever weakness of the heart so marked that only a portion of the beats were transmitted to the pulse at the wrist, a condition that I have elsewhere described as the "acme of cardiac weakness." It is probable that in a large number of cases such a condition is absolutely curable, though the recent investigations of

Thayer suggest that the more marked affections of the heart in typhoid may lead to subsequent disease appreciable by physical examination.

Aside from the irregularity of the heart and the increased rate, other phenomena may be noted. As a rule, dilatation of the heart cannot be or certainly is not diagnosed by percussion; but it is not unusual in the hospital, where careful measurements of the heart area are frequently made, to find in acute disease that the left border may extend some distance to the left of the nipple line. In children and young adults I have frequently seen such a dilatation come on rapidly, and as quickly subside with the improvement in the course of the disease. As the state of the patients in which I have found this condition has not always been serious, I am inclined to the opinion that dilatation might be found more often if its existence were sought for with care. In certain infectious diseases, especially in diphtheria, the affection of the heart is more common than in many others. Doubt has been raised whether the chief disturbing factor in producing incompetency of the heart in acute disease was to be sought for in the nerves or in the muscle of the heart. Until proof to the contrary is forthcoming, the fact that pathologic changes in the myocardium are common seems to weigh in favor of the assumption that the chief trouble is to be sought for in the degeneration of the muscular substance of the heart.

In the course of an acute disease the condition of the heart described above is not usually so marked as in itself to demand attention, aside from that given as routine practice in the care of the case, but in convalescence I have frequently seen irregularity of the heart persist after the main symptoms of the primary disease had entirely subsided. A slow action of the heart is frequently described as a symptom of heart weakness, especially in so-called "fatty heart"; this condition I consider rare, in fact very seldom seen; whereas in disease of the myocardium, as evidenced by weak-

ness subsequent to acute infectious disease, a slow irregular pulse, often intermittent, is a common occurrence. If the patient survive the acute disease, the immediate prognosis of the cardiac condition is certainly good, as sudden death is rare except in diphtheria. From analogy it is more probable that sudden death in diphtheria is due to a disturbance of the nerves than to the pathologic condition of the myocardium.

Aside from acute degeneration of the myocardium already spoken of, other processes may be found. Abscesses in the course of general septicæmia may be found. In gonorrhœa I have seen acute purulent myocarditis ending in sudden death. Acute malignant myocarditis of the same nature as acute malignant endocarditis is not very rare; in an analysis that I made of 59 cases of malignant endocarditis, in three the process was myocardial, and I have recently seen other cases. In none of the cases was the diagnosis made definitely, and probably such a diagnosis could not be absolutely established during life, unless by exclusion. In all the cases the heart was rapid, weak, and the symptoms suggested some serious heart disturbance.

The acute forms of myocardial disease described do not, except in the case of acute abscess, present a picture suggestive of heart disease, but are simply physical conditions that may account for the varying grades of the severity of an illness dependent upon the primary disease which gives rise to the cardiac condition.

In chronic disease of the myocardium we find an entirely different process. A patient consults us for symptoms suggestive of heart disease, shortness of breath, palpitation, precordial distress, cough, and having determined that the essential lesions causative of the disturbance are situated in the heart, we have to decide whether the case under consideration is suffering from valvular disease or from disease of the myocardium.

In approaching the consideration of such a case, determine as accurately as possible the size of the heart by palpation and percussion; the latter method is to my mind more accurate than palpation, and in most cases gives accurate data as to the size of the heart. Frequent comparison of the post mortem findings with the data determined by percussion gives me a good deal of confidence in drawing conclusions from percussion. This opinion is based largely on examination made by house pupils in the hospital, therefore I feel at liberty to make this statement as to the accuracy of percussion. The character of the pulse, the regularity of the beats, and the presence or absence of signs suggestive of chronic passive congestion, determine whether the enlargement be due mainly to dilatation or hypertrophy of the muscular substance. But we may with much certainty assert that where there is enlargement readily appreciable by percussion, a certain amount of dilatation is present. Frentzel makes the statement that in all cases where enlargement of the cardiac area is appreciable by percussion dilatation is present.

In the vast majority of cases the presence of an aortic murmur determines that the trouble is dependent upon degeneration of the aortic valves, and certainly the opposite conclusion can only be decided by post mortem evidence. This is not the case with a murmur in the mitral area. In a large number of cases of myocardial disease there is a regurgitation through the mitral valve, not to be distinguished by its situation, quality or transmission from a murmur produced by endocarditis of the mitral valve. This murmur is certainly not even distantly related to the so-called "hæmic murmur," but is caused by a leak in the mitral valve as shown by the characteristics of the murmur, by the results dependent upon the leak evidenced in chronic passive congestion of remote organs, and associated with great enlargement of the mitral orifice often demonstrated post mortem.

The diagnosis of myocardial disease rather than mitral cannot be made definitely in such a case, but is dependent upon the absence of diseases which usually lead to the production of a mitral endocarditis; farther by the presence of signs usually causative of myocardial disease. As a rule great enlargement of the heart area with marked evidence of dilatation is less common in mitral than in myocardial disease.

Post mortem the heart is found to be enlarged; the weight may not infrequently reach 600 grammes, the normal being perhaps 300 grammes, and cases are often seen in which the heart weighs 800 or 900 grammes. In the larger hearts the cavities are much dilated. Except in early stages the increase in the substance is dependent not upon increase in the muscle but upon fibrous growth into and surrounding the muscular substance. Microscopically the muscular cells are degenerated and are often widely separated by fibrous growth. Large areas are frequently seen in which the muscular substance has practically disappeared, and these are the cases in which local dilatation gives rise to the so-called aneurism of the heart.

Myocardial disease may arise from various pathologic processes:—

First, from disturbances within the heart itself: sclerosis of the coronary arteries, in many cases the direct cause of myocardial disease in that as a result of narrowing of the vessels the nutrition of the heart muscles suffers, and a gradual fibrous degeneration takes place, causing indirectly weakness of the heart. Absolute closure of the coronary vessels in rare instances gives rise to softening of the muscular substance which may end in rupture, as in a case under my observation. In cases with sclerosis of the arteries of the heart precordial pain and distress seem to be more common than in other forms of myocardial disease.

Second, and by far the most common cause, is general

arterio-sclerosis. The younger the individual attacked by sclerosis the greater the probability that the heart will be involved. Arterio-sclerosis is a very common disease, and the size of the heart varies so much in cases which present apparently a similar grade of degeneration in the vessels, that it certainly seems possible that some other element than simple mechanical obstruction enters into the etiology of enlargement of the heart—perhaps a toxæmia which affects directly the heart and the superficial vessels, making both conditions therefore the result of a common etiologic factor. In many cases of intense hardening of the vessels in old age, we find no evidence of any involvement of the heart.

Third, renal disease; especially in the type of chronic kidney disease in which the process consists essentially of a chronic interstitial nephritis. In these cases hypertrophy is the rule, and the heart itself does not usually become sufficiently dilated to become incompetent.

Fourth, many cases are seen in which no pathologic factor can be found,—cases in which we have the history of excessively hard physical labor, but no sclerosis of the arteries is found, and no renal disease.

Fifth, excessive abuse of alcohol in which no gross pathologic lesions are found. Many such cases come under our observation in a hospital clinic. They represent a type of "heart disease," and the heart may be of enormous size. Such cases certainly suggest the possibility that the large hearts found in certain cases of arterio-sclerosis may be dependent upon a toxemia rather than upon a simple mechanical obstruction due to the narrowing of the superficial vessels.

Sixth, a few cases come under our observation in which we find an enormous heart without any known etiology,—cases in which there is no history of hard work, no history of alcohol, and in which no pathologic factor can be found that represents in any way a probable explanation for the enlargement on the theory of mechanical obstruction.

In a few rare cases tumor of the myocardium gives rise to symptoms suggestive of "heart disease." So far as I can say I have not seen this condition except occasionally in syphilitic myocarditis, a condition that I have diagnosed.

Enough has been said to show that "heart disease" does not always mean valvular disease of the heart. In fact, from statistics that I have gathered and published from clinical observations, and from post mortem records, valvular disease of the heart is found in only about half of the cases of "heart disease."

DISCUSSION.

Dr. J. H. Pratt, of Boston: I have recently been studying the relation of diseases of the heart muscle to cardiac insufficiency, with special reference to the significance of fatty degeneration, and I am pleased to learn that my observations, so far as they go, accord with the conclusions of Dr. Jackson. I agree with him and with recent German investigators, notably Krehl, Romberg and Albrecht, that fatty degeneration of the myocardium has little if any clinical significance. As Dr. Jackson says, the text-books pay too little attention to myocardial disease. Even in cases of chronic endocarditis the condition of the heart muscle is more important than the valvular lesion. The most frequent cause of broken compensation, according to Krehl, Kelle and Albrecht, is acute interstitial myocarditis. They found that when the entire heart was cut into small blocks, and sections studied from each block, that pathological alterations in the heart muscle were always present.

Interesting experimental work from Curschmann's clinic by Romberg, Pässler and Rolly indicates that in diphtheria the circulatory disturbances which occur early in the disease are due to injury of the vaso-motor apparatus by the diphtheria toxin, while the circulatory disturbances which occur during convalescence are, as Romberg pointed out some ten years ago, the result of an acute interstitial myocarditis.

Dr. H. H. Smith, of Boston: The statement is frequently made that sudden death from heart failure is common in diphtheria. During my two years' connection with the South Department of the Boston City Hospital, I did not see an instance of sudden death from this cause, although there were several from respiratory obstruction. Several patients taken from the hospital by parents or friends before they were ready for discharge, have subsequently died suddenly, death in each instance taking place during the third week of the illness.

ARTICLE LIII.

A CASE OF MALIGNANT ENDOCARDITIS.

By J. F. ALLEYNE ADAMS, M.D.
OF PITTSFIELD.

READ JUNE 7, 1904.

A CASE OF MALIGNANT ENDOCARDITIS.

Mr. E. A. B. aged 35, born in England, married, telephone manager.

On the morning of July 13th, 1903, he was attacked with a chill, and came to my office, saying he could not get warm. He had been swimming the afternoon before, had been a long time in the water, and felt cold. He had previously been well, except that he had a bronchial cough for a short time the last winter, and in May complained of *muscæ volitantes* for a few days, caused by constipation. He was a man of nervous temperament and active habits, who worked very hard at his business and devoted the latter part of each afternoon to athletic pursuits, such as golf and swimming. I found his temperature normal at ten o'clock. He went home and I called to see him at 3 P.M. Temp. then 103, and the same in the evening, falling to 102 between these times. He complained of "soreness of the ribs," meaning the short ribs on both sides, especially the left. It hurt him to take a long breath, and he would frequently blow out the breath, explosively. His wife said this had been a habit with him. Examination of the heart and lungs revealed nothing abnormal. The area of the spleen was somewhat enlarged; liver normal size; abdomen rigid, without tenderness or pain. In the evening he was dull, saying little and hardly answering questions. He said he could not see

clearly. From this time the temperature continued high and irregular, rising to 104 3-5 on the fifth day. He was dull and sometimes mildly delirious during the first week. On the third day, an erythematous eruption appeared on the lower part of the chest, in front, disappearing the next day. On the fifth day, the abdomen was greatly distended, causing much pain and distress. This was relieved by a dose of calomel followed by a saline, which caused the expulsion of much gas.

On July 18th, the sixth day, he was removed from his home to the Pittsfield "House of Mercy" where he was quite comfortable for ten days, with temperature rather lower than the first few days. He was still dull and talked very little, but was quite rational. He had no more soreness of the ribs, no dyspnœa, no cough, and had the general aspect of typhoid fever. But no rose-spots appeared, there was no diarrhœa, and the Widal test gave a negative result. This was made by Dr. H. C. Emerson of Springfield, Mass., with blood taken on the 3d, 7th and 13th days of the disease, and also by Dr. R. A. Woodruff of Pittsfield on the 18th day, each time with negative reaction. Dr. Woodruff also made a blood count on the 18th day, showing:

Red corpuscles - - - -	3,200,000
White corpuscles - - - -	18,000
Hæmoglobin - - - - -	48%

On July 27th, the 15th day, he began to have epistaxis, the blood running back into the throat and most of it swallowed, blackening the stools. This continued for a week, and considerable blood was lost in this way.

On July 28th, the 16th day, on making an examination with stethoscope, I discovered a *heart-murmur*, systolic, at apex. This was soft, smooth and faint, and heard over a small area, below the nipple, not at all at the base of heart or anywhere above the nipple. The lungs were normal;

there were no heart symptoms. The temperature was lower than usual in the morning, being 100; but it rose to 102 3-5 in the evening, to 103 3-5 the following morning, and to 104 4-5 the following evening. From this date, the patient rapidly grew worse; the murmur became louder each day and was heard over a larger area, until on August 1st, the 20th day, it was a loud, rough, churning sound, heard all over the heart area and well around on the left side of the chest.

On July 30th, the 19th day, he began to have dyspnœa at times, breathing rapidly for a few respirations. The following day, the dyspnœa was increased and in the evening he would at times open the mouth wide and seem to gasp for air.

From July 30th to Aug. 2d, there was retention of urine and the catheter was used, the amount drawn being three pints a day. The urine of July 30th contained a trace of albumen, but there was none previously nor later. August 3d, the urine was passed involuntarily and so continued until his death, the amount three pints or more. He grew more dull and looked very white and anemic. There was a reaching out with the hands and picking at the air. Epistaxis ceased on August 2d.

On August 4th, 23d day, the bowels moved involuntarily. There then appeared a partial paralysis of the right arm and leg, with a dropping of the left upper eyelid. There was no picking at the bedclothes after this, and the patient lay perfectly still. At times there was a gasping for breath, but never any orthopnœa.

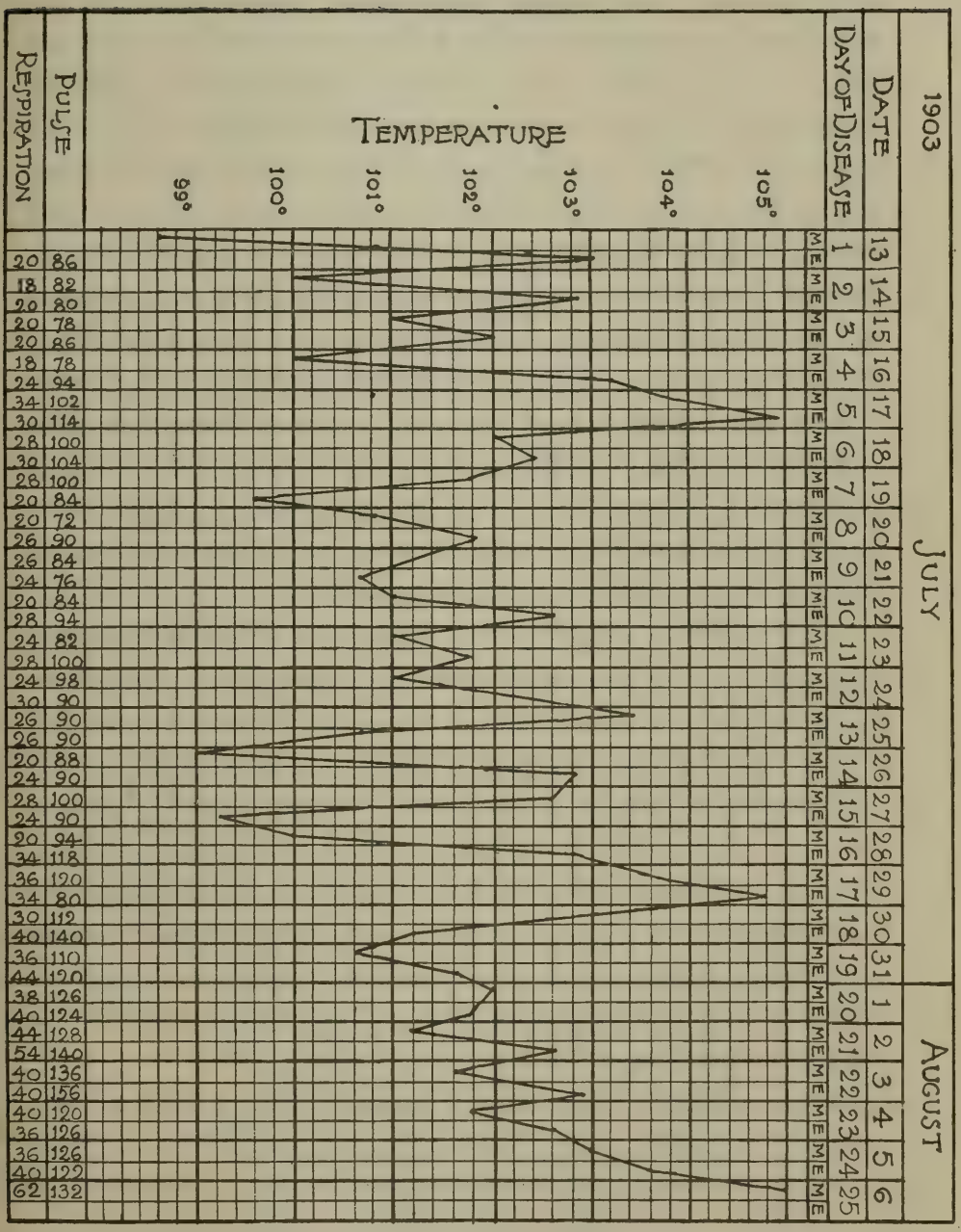
August 5th, 24th day, his color was ashy, and for the first time there was difficulty in swallowing. A few petechiæ appeared on the chest and abdomen about August 2d and gradually increased in number until they covered the upper chest, abdomen and forearms.

August 6th, 25th day, died at 12.45 noon. He was unconscious during the night and morning, but could be made to swallow milk or medicine if spoken to.

During the last few days there was dullness over the base of both lungs, with absence of vesicular murmur, but without râles. There was no cough at any time. The pulse, throughout the attack, was soft, full, and regular. Toward the last it grew very soft and compressible, though still full and regular. Its frequency was from 80 to 100 until the 16th day, when the heart-murmur appeared, and after this was 120 or more. The respiration ranged from 18 to 30 until the 16th day, and after that from 30 to 50. Urine was secreted freely to the end. There was never any diarrhœa.

TREATMENT.—At the outset he had a dose of calomel, followed by a seidlitz powder, and this was repeated on the 5th and 11th days. During the first few days he took salicylate of sodium, grs. viii., every three or four hours. After this he was given a tablet containing guaiacol, menthol, thymol, and eucalyptol, every two hours until the end of the second week. Strychnia was given throughout the attack. During the last week he also had tr. digitalis and an enema thrice daily of a quart of normal salt solution, fully half of which was retained. At night he usually had one or two doses of codeine, 1-4 gr. each, which quieted restlessness and produced sleep. Tepid sponging was used several times daily, and was usually followed, especially during the first and second week, by a drop of temperature of one or two degrees. The bowels were kept open by enemata.

AUTOPSY.—*Heart.*—The pericardium contains about one ounce of clear fluid; no adhesions. Size of heart $4\frac{1}{2}$x$5\frac{1}{2}$ inches. Many petechial hemorrhages on anterior surface, particularly over right auricle and ventricle, just within the visceral serous covering. Heart fat fair in amount. Heart muscle flabby. Veins of heart distended with dark, liquid blood. On section, *right auricle* contains post-mortem clots and partly organized ante-mortem clots. The auri-


1903
July
August
Date
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6
Day of Disease
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E
Temperature
105°
104°
103°
102°
101°
100°
99°
Pulse
86 82 80 78 86 78 94 102 114 100 104 100 84 72 90 84 76 84 94 82 100 98 90 90 90 88 90 100 90 94 118 120 80 112 140 110 120 126 124 128 140 136 156 120 126 126 122 132
Respiration
20 18 20 20 20 18 24 34 30 28 30 28 20 20 26 26 24 20 28 24 28 24 30 26 26 20 24 28 24 20 34 36 34 30 40 36 44 38 40 44 54 40 40 40 36 36 40 62

cular appendage has organized clots (marantic). *Right ventricle* contains ante-mortem clots fully organized; probably marantic in origin. *Tricuspid valves* seem to be competent, but covered with a fibrinous exudate of recent origin, and valves are somewhat thickened. Papillary muscle and chordæ tendineæ practically normal. *Left auricle* negative. *Left ventricle* contains ante-mortem and post-mortem clots. *Mitral valves* are thickened and eroded and are covered with an ulcerative exudate forming excrescences of various sizes, some as large as a hazel nut, and in the exudate are pockets containing pus. Papillary muscle atrophied. Chordæ tendineæ thickened and imbedded in the inflammatory exudate. *Heart muscle* is pale and shows areas of brown atrophy, with areas of recent myocardial inflammation. Coronaries patent; no sclerosis. A few patches of beginning sclerosis in the aorta. Aortic and pulmonic semilunar valves normal.

Left Lung. Free from adhesions. Petechial hemorrhages cover the visceral pleura. Upper lobe crepitant in its upper and anterior portion. The rest of this lobe and the lower lobe firm to touch and dark in appearance. On section, lower half of upper lobe in a state of red hepatization. Lower lobe in an organized pneumonic condition. Bronchi contain a frothy, bloody exudate. Branches of the pulmonary artery supplying the lower and posterior portion of the upper lobe and the whole of the lower lobe contain thrombi, more or less organized. Bronchial mucous membrane thickened and injected.

Right Lung. Free from adhesions. The posterior portion of the upper lobe is hard and nodular and shows four or five old scars. Anterior portions of upper, middle and lower lobes are crepitant throughout. Posterior portion of all the lobes firm and solid to the touch and dark in appearance. The visceral pleura shows many petechial hemorrhages. On section, the bronchi contain frothy, bloody

material and the mucous membranes are injected. The hard nodule in apex proves to be an infarct partly organized. The middle and lower lobes are pneumonic, and the pulmonary vessels supplying the posterior portion of the lobes contain thrombi.

Spleen measures 6x4½ inches; very soft in consistency and of a chocolate color. On anterior surface there is an infarct 4x1½ inches, which extends through the organ from before backward. Also at the posterior and dependent angle there is an infarct 1x1 inch. This infarct contains liquid blood, on section. Spleen pulp very soft; all markings very indistinct. The large infarct is hard and cuts firm, and over the infarcted area there is a perisplenitis.

Left Kidney 5½x3½ inches. Fatty capsule well marked. Fibrous capsule thickened and strips readily. Surface of kidney studded all over with petechial hemorrhages, some of them being 1-8x1-8 inch; and on section these hemorrhages extend into the substance of the organ. The inferior pole of the kidney is blue in appearance. Several small white infarcts. Cortex 1-2 to 3-4 in. thick. Malpighian bodies distinct in appearance. In the pelvis of this kidney and extending into the substance of the organ, there is a small abscess.

Right Kidney 5x3 in., similar in appearance to the left, but without the abscess.

Liver 10x9x3½ in., surface smooth, consistency fairly solid; free from adhesions; light yellow in color; no infarcts; cuts fairly firm, and yet the substance in scraping breaks readily. The organ gives all the appearances and conditions of passive congestion.

Stomach normal in size; mucous membrane thickened and studded with petechial hemorrhages.

Intestines normal, except being in a state of passive congestion.

Appendix six inches long; filled with concretions, and

adherent to the cæcum in a circular manner, for three inches; not inflamed.

Pancreas 7x1¾ in., fairly firm, and appears normal.

Brain and *Spinal Cord* not examined.

Bacterioscopic examination of smears from the various organs and the blood from the heart showed staphylococci and a short rod bacillus, presumably the colon, as a terminal infection.

Portions of the heart-muscle, spleen, liver and left kidney were examined microscopically at the Bender Laboratory in Albany, and the following report received:

Spleen shows a recent anæmic infarct.

Liver. In cells about the glands of the lobules is an accumulation of pigment, of light yellow color, appearing in fine granules. The capillaries of centre of lobules are slightly dilated; liver otherwise negative.

Heart-Muscle. Muscle fibres are slightly vacuolated. Nuclei somewhat pycnotic. The intermuscular tissue moderately œdematous. On the endocardial surface are portions of small marantic thrombi.

Kidney. Tubules moderately dilated. Inter-tubular tissue œdematous. In the lumen of tubules is an accumulation of fine granular coagulated material, but no definite casts. Glomeruli slightly lobulated. The enlarged capsular space contains granular coagulated material similar to that in tubules. There is no accumulation of lymphoid cells or increase of inter-tubular tissue.

Diagnosis.—At the outset the case looked like a severe attack of grippe, but, the fever continuing, without local symptoms, it was called provisionally atypical typhoid fever, though the negative Widal tests and the absence of diarrhœa and rose-spots made the accuracy of this diagnosis seem very improbable. After the heart-murmur appeared, the diagnosis of malignant endocarditis was made; and this was borne out by the rapid progress of the heart symptoms, and

the supervention of local conditions evidently embolic, of which the most striking were the double pneumonia and the partial right hemiplegia from cerebral embolism. The leucocytosis as well as the petechial eruption tended still further to support this diagnosis. This was confirmed by the autopsy, which revealed ulcerative endocarditis, double pneumonia, thromboses of branches of the pulmonary vessels, parenchymatous nephritis, infarcts in spleen, lung and kidney, abscess of left kidney, and passive congestion of liver and other organs, with staphylococcus infection.

This disease, which is variously designated malignant, ulcerative or infectious endocarditis, bears a general resemblance to typhoid fever, for which it is frequently mistaken. The temperature, however, does not follow the typhoid curve, but is distinctly that of a septic fever, being high at the outset, and subject to great and irregular diurnal variations. It differs from simple endocarditis in the greater size and abundance of the vegetations on the cardiac valves, the breaking down of these vegetations, with ulceration and suppuration, the numerous infarctions of other organs, the general violence of the symptoms, and the almost invariable fatal termination. Although the heart is the seat of the primary lesion, it is a curious fact that the heart symptoms are never very pronounced, that the heart murmur is seldom heard in the early stages of the disease and is sometimes wholly absent, the true nature of the disease being only learned at the autopsy.

Two symptoms which are common in malignant endocarditis were absent in this case—namely, chills and sweating. Sweating did occur toward the end of the attack, but not during the first two weeks, and the initial chill was the only one.

Before the appearance of the heart-murmur, there was no possibility of making a definite diagnosis. The negative Widal reaction made the diagnosis of typhoid fever more and

more doubtful, this test being applied on the 3d, 7th, 13th and 18th days. This almost positively excluded typhoid, and yet there are cases closely resembling typhoid, but not giving the Widal reaction. In these cases a bacillus has been found which appears intermediate between the typhoid and colon bacillus, and has been named the paratyphoid bacillus. The disease is usually of a milder type than typhoid, although fatal cases are reported.

On the other hand, the presence of the Widal reaction would not absolutely exclude malignant endocarditis, for Dr. W. Hale White reports a case in Grey's Hospital, London, of true malignant endocarditis of streptococcal origin which gave a positive Widal reaction on four occasions.

Dr. Henry L. Elsner, in the Medical News of May 9, 1903, says, in reference to the diagnosis, that "considered collectively, typhoid fever shows a surprisingly infinitesimal number of permanent heart lesions during the acute febrile period, or following. Hence, with evidences of endocarditis and the typhoid condition, we are justified in assuming that the disease is not typhoid fever. To make the diagnosis positive ante-mortem, we must have the presence of physical signs referable to the heart, and these we have in the majority of our cases before death. However, the endocardium may be plastered with vegetations without giving rise to physical signs. The presence of embolic infarcts is a valuable diagnostic fact."

Osler (Practice of Medicine, 4th ed. p. 705) says: "Perhaps a majority of the cases not associated with puerperal processes or bone disease are confounded with typhoid fever. A differential diagnosis may even be impossible, particularly when we consider that, in typhoid fever, infarction and parotitis may occur." He adds: "Points which may guide us are, the more abrupt onset in endocarditis, the absence of any regularity of the pyrexia in the early stage of the disease, and the cardiac pain. Oppression and shortness of

breath may be early symptoms in malignant endocarditis. Rigors, too, are not uncommon. There is a marked leucocytosis."

In this case we had the abrupt onset and irregular pyrexia; but never any cardiac pain and little or no oppression or shortness of breath until the last week. Leucocytosis was very marked on the 18th day.

Although malignant endocarditis most commonly occurs as a secondary affection as in acute rheumatism, pneumonia, or septicæmia, it is recognized as sometimes occurring as a primary disease. Such seems to be the case under consideration. At any rate I have been unable to discover any antecedent septic condition. All the lesions found were apparently secondary to the endocarditis. A possible exception is the nephritis, but of this there had been no symptoms, for I found the urine normal two months before this illness and also at the beginning of the attack. As for the small abscess in the left kidney, this was most likely metastatic. If these renal conditions are considered secondary, as they probably should be, we seem compelled to call the case one of primary malignant endocarditis. Perhaps it would be better described as a case of septic endocarditis, in which the origin of the infection was not discovered.

The autopsy and bacteriological examinations were made by Dr. R. A. Woodruff, of Pittsfield. The case was seen in consultation by Drs. Henry Colt and L. C. Swift of Pittsfield and by Dr. W. Gilman Thompson of New York.

DISCUSSION.

Dr. C. F. Withington, of Boston: I have been very much interested in this extremely carefully prepared report of this case of Dr. Adams. He mentioned the differential points in the diagnosis of this disease and typhoid fever.

It seems to me that it is one of the most important discriminations to bear in mind. In the cases I have seen the temperature was almost always irregular with marked evening exacerbations. There were other signs of sepsis, including the one he mentions and emphasizes — petechiæ on the surface of the body. I saw a case a few weeks ago at the New England Hospital with multiple abscesses. There was an abscess of the ankle joint, one on the buttocks, and one on the back. The sero-pus from one of these abscesses showed the streptococcus.

One very important point is the prognosis. It is a disease that is almost invariably fatal, although I have seen two cases which I have reason to believe were ulcerative endocarditis and which did not die. Two years ago I saw the first of these. The temperature was irregular, chills, sweating, with no other explanation than that suggested by the endocardial murmur. The diagnosis was confirmed by Dr. Whittier, and the patient, after a protracted illness, recovered. I have recently had a case at the hospital of a man of 26. He entered the hospital April 19th. He had had measles four weeks previously, but had recovered from them, and two days later had a chill, followed by an irregular temperature, cough, sweat and chills. Four days before coming into the hospital he had phlebitis, the limb being dark purple and swollen. The heart was enlarged, the action very violent, and the rate 160 to 170. There was marked gallop rhythm. He also had limited but distinct areas of consolidation in both lungs, which were believed to be embolic pneumonia. Six weeks before coming into the hospital he had had acute gonorrhœa. That took place on the 17th of March, and the measles on the 22d of March. Forty-eight days after the gonorrhœa blood cultures were taken and the gonococci were found. There was no doubt about the accuracy of the observations, and the diagnosis of malignant gonorrhœal endocarditis seems established. Dr. Adams's case was from staphylococcus infection. This one was from gonococcus infection. This patient gradually improved, and his temperature became normal. For a month he has been practically well, his phlebitis has largely disappeared, and he is walking about. He has no symptoms at all now, though there is still a murmur. The white count has gone from 16,200 down to

9,400. I think we may say that although such cases are usually fatal, and the prognosis always exceedingly grave, occasional cases may recover.

Dr. Henry Jackson, of Boston: It has always been my opinion that malignant endocarditis was fatal. I saw the case referred to by Dr. Withington in consultation with Dr. Ames, and we were much pleased to have the diagnosis confirmed by him. I look upon the case as the first one I have known to get well of this disease.

Dr. G. S. C. Badger, of Boston: There are two clinical forms of malignant endocarditis, — the non-septic and the septic. The former is attended by bland infarcts, suppuration does not follow, and therefore there are no abscesses. Chills and sweating are not very common in this type of the disease. In the septic variety the infarcts suppurate, abscesses develop, and chills and sweating are very common. In the case mentioned by Dr. Withington there were multiple abscesses accompanied by chills and sweating. In the case reported by Dr. Adams the infarcts were bland and chills were not common. Both these varieties may be due to the same organism; for example, the streptococcus.

The Massachusetts Medical Society.

PROCEEDINGS.

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The Massachusetts Medical Society.

PROCEEDINGS OF THE COUNCILLORS.

October 2, 1901.

A Stated Meeting of the Councillors was held in the Medical Library, Boston, on Wednesday, October 2, 1901, at 12, noon.

The President, Dr. Frank W. Draper, in the chair.

The following Councillors were present:

Berkshire.
O. J. Brown,
H. Bushnell.

Bristol North.
S. D. Presbrey.

Bristol South.
G. deN. Hough.

Essex North.
J. G. McAllister.

Essex South.
H. K. Foster,
A. F. Hunt.

Franklin.
G. P. Twitchell.

Hampden.
C. W. Jackson,
J. E. Marsh,
J. P. Schneider.

Hampshire.
C. F. Branch.

Middlesex East.
J. P. Bixby,
F. E. Park,
S. H. Parks.

Middlesex North.
J. B. Field.

Middlesex South.
Z. B. Adams,
D. E. Baker,
R. E. Brown,
J. E. Cleaves,
C. H. Cook,
E. Cowles,
E. A. Hobbs,
E. G. Hoitt,
E. D. Hooker,
R. P. Loring,
H. B. McIntire,
H. P. Makechnie,
H. E. Marion,
J. T. G. Nichols,
A. L. Norris,
G. A. Oviatt,
C. E. Prior,
F. M. Sherman,
L. R. Stone,
H. P. Walcott,
J. W. Willis.

Norfolk.
H. D. Arnold,
E. E. Bancroft,
F. A. Bragg,
H. M. Cutts,
F. P. Denny,
F. P. Emerson,
I. S. Fogg,
G. H. French,
I. H. Hazelton,
H. R. Hitchcock,
A. D. Hodges,
G. H. Ingalls,
G. W. Kaan,

R. M. Merrick,
E. G. Morse,
H. V. Reynolds,
L. F. Vickery,
A. G. Williams.

Norfolk South.
C. S. Adams,
N. S. Hunting,
E. N. Mayberry,
V. M. Tirrell.

Plymouth.
H. W. Dudley,
F. G. Wheatley.

Suffolk.
J. B. Ayer,
E. M. Buckingham,
J. F. Bush,
D. W. Cheever,
A. Coolidge, Jr.,
E. G. Cutler,
F. W. Draper,
R. H. Fitz,
C. F. Folsom,
C. M. Green,
J. Homans,
J. H. McCollom,
A. B. Morong,
J. M. Putnam,
W. L. Richardson,
F. C. Shattuck,
G. B. Shattuck,
J. C. White,
E. N. Whittier,
G. Wolcott.

Worcester.
W. Davis,
G. E. Francis,
E. B. Harvey,
S. P. Holbrook,
J. O. Marble,
E. W. Norwood,
H. M. Quinby,
E. V. Scribner,
E. R. Wheeler.

Worcester North.
B. H. Hartwell,
F. H. Thompson.

Total, 92.

The record of the last meeting was read and accepted.

The following were appointed Delegates to other State Medical Societies:

Vermont.—F. H. Thompson, of Fitchburg; C. H. Cook, of Natick.

New York.—C. Seymour, of Northampton; W. N. Bullard, of Boston.

New York State Medical Association.—F. I. Knight, of Boston; W. W. Scofield, of Dalton.

The Committee on Membership and Finance reported through Dr. Cutler. In accordance with their recommendation, it was voted that the following be allowed to resign:

Lemuel H. Hammond, of Worcester.
Maurice A. Stark, of Goffstown, N. H.

Also, that the following be deprived of the privileges of membership in accordance with By-Law VIII. for non-payment of dues:

James W. Babcock, of Columbia, S. C.
Joseph G. Burque, of Haverhill.
Arthur B. Chase, of Lynn.
Chandos B. Conner, of Provincetown.
David G. Coolidge, of Athol.
Joseph J. Cronin, of Roxbury.

William W. Early, of Plymouth, N. C.
Arthur F. Edwards, of Bonanza, Can.
Charles D. Fillebrown, of Boston.
Samuel K. Frost, of New York, N. Y.
Andrew L. Grieve.
Mahlon F. Hall, of Revere.
Louis F. X. A. Hurtubise, of Lowell.
Henry D. Kennard, of Peabody.
William E. Kernan, of Neponset.
Dudley Leavitt, of Pittsfield.
Frederick W. Pearl, of Boston.
Oscar J. Pfeiffer, of Denver, Col.
Henry L. Plummer, of East Boston.
Frank E. Rhodes, British Army.
Robert O. Ross, of Danville, P. Q., Can.
Philippe St.Marie.
Berkeley Sherwood-Dunn, of New York, N. Y.
Henry A. Webber, U. S. Army.

Voted, That the following be restored to the privileges of membership:

Ella Gertrude Stone, of Cambridge.
Melville Emerson Webb, of Boston.

To fill vacancy caused by the resignation of Dr. M. H. Richardson, Dr. A. K. Stone was elected Councillor for the Suffolk District.

The Chair announced that Dr. Willard S. Everett, of Hyde Park, had been appointed to deliver the Annual Discourse at the next annual meeting of the Society, in place of Dr. George S. Eddy who had declined the appointment.

Dr. Cheever presented the subject of "Privileged Medical Communications," calling attention to the fact that in Massachusetts, by the common law, the physician is obliged to state publicly, on the witness stand, whatever may have been told him by his patient.

Voted, That the subject be referred to the Committee on State and National Legislation.

Adjourned at 1 P.M.

FRANCIS W. GOSS,
Recording Secretary.

February 5, 1902.

A Stated Meeting of the Councillors was held in the Medical Library, Boston, on Wednesday, February 5, 1902, at 12, noon.

The President, Dr. Frank W. Draper, in the chair.

The following Councillors were present:

Barnstable.
C. E. Harris.

Bristol South.
W. A. Dolan.

Essex North.
J. G. McAllister.

Essex South.
H. K. Foster,
P. Mooney.

Franklin.
G. P. Twitchell,
A. C. Walker.

Middlesex East.
J. P. Bixby,
C. W. Harlow,
F. E. Park.

Middlesex North.
W. G. Eaton,
J. B. Field.

Middlesex South.
Z. B. Adams,
R. E. Brown,
J. E. Cleaves,
A. G. Griffin,
E. A. Hobbs,
E. G. Hoitt,
E. D. Hooker,
R. P. Loring,
H. B. McIntire,
H. P. Makechnic,
J. T. G. Nichols,
A. L. Norris,
G. A. Oviatt,
C. E. Prior,
F. M. Sherman,
E. H. Stevens,
L. R. Stone,
H. P. Walcott,
A. C. Webber,
J. W. Willis.

Norfolk.
F. R. Abbe,
E. E. Bancroft,
F. A. Bragg,
J. E. Butler,
H. M. Cutts,
F. P. Denny,
F. P. Emerson,
I. S. Fogg,
G. H. French,
D. H. Fuller,
I. H. Hazelton,
H. R. Hitchcock,
A. D. Hodges,
G. W. Kaan,
E. B. Lane,
E. G. Morse,
W. Noyes,
L. F. Vickery,
A. G. Williams.

Norfolk South.
C. S. Adams,
N. S. Hunting,
E. N. Mayberry.

Plymouth.
H. W. Dudley,
A. E. Paine,
F. G. Wheatley.

Suffolk.
E. H. Bradford,
J. F. Bush,
D. W. Cheever,
A. Coolidge, Jr.,
E. G. Cutler,
F. W. Draper,
T. W. Fisher,
R. H. Fitz,
W. W. Gannett,
M. F. Gavin,
C. M. Green,
B. J. Jeffries,
J. H. McCollom,
F. G. Morrill,
A. H. Nichols,
C. B. Porter,
A. Post,
J. J. Putnam,
J. M. Putnam,
W. L. Richardson,
T. M. Rotch,
G. B. Shattuck,
A. K. Stone,
J. B. Swift,
H. F. Vickery,
O. F. Wadsworth,
J. C. White,
E. N. Whittier,
H. Williams,
G. Wolcott.

Worcester.
P. P. Comey,
W. Davis,

G. E. Francis,
E. B. Harvey,
J. O. Marble,
E. W. Norwood,
H. M. Quinby,
E. V. Scribner.

Worcester North.
B. H. Hartwell,
C. H. Rice,
F. H. Thompson.

Total, 98.

The record of the last meeting was read and accepted.

The following were appointed Delegates to other State Medical Societies:

Maine.—E. H. Bradford, of Boston; J. A. Gage, of Lowell.
New Hampshire.—J. L. Hildreth, of Cambridge; Benjamin Tenney, of Boston.
Rhode Island.—V. Y. Bowditch, of Boston; J. A. Gordon, of Quincy.
Connecticut.—C. S. Holden, of Attleboro'; H. R. Hitchcock, of Hyde Park.
New Jersey.—H. W. Newhall, of Lynn; H. H. Seelye, of Amherst.

The following Committee was appointed:

To Audit the Treasurer's Accounts.—H. W. Broughton, Malcolm Storer.

The Committee on Membership and Finance reported through Dr. Cutler. In accordance with their recommendation it was voted that the following be allowed to resign:

Benjamin Benoit, of Lowell.
Fitz A. Oakes, of Providence, R. I.
John H. Sullivan, of Springfield.

Also, that the following be deprived of the privileges of membership in accordance with By-Law VIII. for non-payment of dues:

James A. Coyne, of Clinton.

The President stated that the President of the American Medical Association had requested that, in accordance with recent changes in the Constitution and By-Laws of the Association, The Massachusetts Medical Society appoint delegates to the House of Delegates of the American Medical Association.

In compliance with this request the following was passed:

Whereas, recent changes have been made in the Constitution and By-Laws of the American Medical Association re-organizing its form of Government, in conformity thereto,

Voted, That the Resolution adopted by the Councillors in February, 1852, authorizing the District Societies, or their Presidents and Secretaries, to appoint delegates to the American Medical Association, to be entitled Delegates of The Massachusetts Medical Society, be rescinded.

Voted, That the Councillors, on nomination of the President, appoint delegates to the House of Delegates of the American Medical Association in accordance with the provisions of the Constitution and By-Laws of the said Association.

On nomination by the President, the following were appointed to the House of Delegates for one year, 1902:

F. C. Shattuck, C. H. Williams, J. F. A. Adams.
Alternates.—W. N. Swift, A. G. Minshall, B. H. Hartwell.

For two years, 1902 and 1903:

W. T. Councilman, H. E. Marion, J. C. Warren.
Alternates.—S. D. Presbrey, W. M. Mercer, Albert Wood.

Adjourned at 1.15 P.M.

FRANCIS W. GOSS,
Recording Secretary.

JUNE 10, 1902.

THE ANNUAL MEETING of the Councillors was held in the Medical Library, Boston, on Tuesday, June 10, 1902, at 5 P.M.

The President, Dr. FRANK W. DRAPER, in the chair.

The following Councillors were present:

Berkshire.
O. J. Brown,
H. Bushnell.

Bristol North.
C. A. Atwood,
T. J. Robinson.

Bristol South.
W. A. Dolan,
G. deN. Hough.

Essex North.
G. M. Atwood,
J. A. Douglass,
C. E. Durant,
J. G. McAllister,
J. F. Young.

Essex South.
C. H. Bangs,
F. L. Judkins,
H. W. Newhall,
P. C. Proctor,
J. Shanahan,
M. C. Smith,
B. R. Symonds.

Franklin.
G. P. Twitchell.

Hampshire.
R. E. Dickson.

Middlesex East.
C. E. Chase,
J. W. Heath,
G. N. P. Mead.

Middlesex North.
C. E. Simpson.

Middlesex South.
D. E. Baker,
J. E. Cleaves,
C. H. Cook,

J. G. Dearborn,
E. A. Hobbs,
E. G. Hoitt,
E. D. Hooker,
H. B. McIntire,
H. P. Makechnie,
J. T. G. Nichols,
A. L. Norris,
G. A. Oviatt,
F. M. Sherman,
S. G. Soules,
E. H. Stevens,
L. R. Stone,
H. P. Walcott,
J. W. Willis,
H. A. Wood.

Norfolk.

F. R. Abbe,
F. A. Bragg,
J. E. Butler,
H. M. Cutts,
F. H. Davenport,
F. P. Denny,
I. S. Fogg,
G. H. French,
D. H. Fuller,
I. H. Hazelton,
A. D. Hodges,
G. W. Kaan,
J. H. S. Leard,
R. M. Merrick,
E. G. Morse,
W. Noyes,
W. T. Patch,
A. P. Perry,
L. A. Roberts,
E. P. Starbird,
W. N. Tenney,
A. G. Williams,
E. C. Wylie.

Norfolk South.

C. S. Adams,
E. N. Mayberry,
V. M. Tirrell.

Plymouth.

H. W. Dudley,
N. K. Noyes,
A. E. Paine,
F. G. Wheatley.

Suffolk.

J. B. Ayer,
E. H. Bradford,
E. M. Buckingham,
H. L. Burrell,
J. F. Bush,
B. F. Campbell,
D. W. Cheever,
A. Coolidge, Jr.,
E. G. Cutler,
H. Derby,
F. W. Draper,
T. W. Fisher,
R. H. Fitz,
C. F. Folsom,
W. W. Gannett,
G. F. Jelly,
F. I. Knight,
J. H. McCollom,
A. B. Morong,
A. H. Nichols,
C. B. Porter,
A. Post,
W. L. Richardson,
G. H. M. Rowe,
F. C. Shattuck,
G. B. Shattuck,
A. K. Stone,
J. B. Swift,
H. F. Vickery,
O. F. Wadsworth,
J. C. Warren,
J. C. White,

Worcester.

P. P. Comey,
W. Davis,
O. H. Everett,
S. P. Holbrook,
J. O. Marble,
E. W. Norwood,
E. V. Scribner,
L. Wheeler,
A. Wood,
S. B. Woodward.

Worcester North.

F. H. Thompson.

Total, 117.

The record of the last meeting was read and accepted.

The Secretary read the names of new and of deceased Fellows.

The Treasurer, Dr. Buckingham, read his annual report.

The Auditing Committee reported that they found the accounts correctly cast and properly vouched, and that the Treasurer has in his possession the securities called for.

Voted, To accept the Treasurer's report.

The Committee on Membership and Finance reported through

Dr. Cutler, and recommended that $4,000.00 of the surplus in the treasury be distributed among the District Societies.

Voted, That the recommendation be adopted.

In accordance with the recommendation of the same Committee it was voted, that the following be allowed to resign :

Charles V. Buttler, of Mystic, Conn.
Albert S. Dolloff, of New Hampton, N. H.
Adolf Meyer, of New York, N. Y.
Herbert E. Smyth, of Bridgeport, Conn.

Also, that the following be placed on the retired list:

Asahel S. Deane, of Taunton.
Jerome Dwelly, of Fall River.
Samuel W. Fletcher, of Pepperell.
Tappan E. Francis, of Brookline.
Daniel W. Wight, of West Medford.

Also, that the following be deprived of the privileges of membership under By-Law VIII. for non-payment of dues:

Charles H. Barney, U. S. Army.
Charles F. Haynes, of Brighton.
Charles E. Lockwood, of Hallstead, Pa.
Edward W. Pinkham, U. S. Army.

The Committee on Publications reported through Dr. Wadsworth.

The Committee on State and National Legislation reported—that it has been represented at various legislative hearings during the current session of the General Court, in accordance with the provisions of the vote passed by the Councillors February 5, ult., and it has taken part in the remonstrance called forth by various petitioners for more or less mischievous legislation affecting the interests of the medical profession.

The Society appeared among the remonstrants against the bill for regulating vivisection, the bill in opposition to compulsory vaccination, the bill to modify the law relating to registration in medicine, and bills to recognize osteopathy and to grant certain privileges to osteopaths. Upon all the measures the petitioners were given leave to withdraw.

Upon the petition for a law to provide for the preparation of pure vaccine virus under the auspices of the State Board of Health, the Committee appeared in favor of the bill and the matter is still pending.

Two measures were especially referred to the Committee by the Council, and upon these it reports as follows:

1. Relative to the proposition presented by Dr. H. R. Hitchcock at the last annual meeting, concerning a reform in the preparation and publication of the Vital Statistics of Massachusetts, the Committee while favoring the project in its general relations, respectfully recommends that a new reference be made to a special Committee of three fully familiar with the facts and relations of the subject, to report its conclusions to the Council at a later meeting.

2. With reference to Dr. D. W. Cheever's communication concerning the protection of physicians from the obligation of revealing as witnesses in courts of law, except in criminal proceedings, communications confidentially imparted to them by their patients, the Committee is unable to agree upon formal conclusion, and it recommends that the Committee to Procure Scientific Papers for the next Annual Meeting be instructed to secure contributions and a full discussion upon the subject of privileged communications so that the Society may act with a fuller knowledge of the matter and of the sentiment of the Fellows than it has at present.

Voted, To accept the report and to adopt its recommendations.

The following were appointed to constitute the Committee concerning the preparation and publication of the Vital Statistics of Massachusetts :

C. F. Folsom, J. M. French, H. R. Hitchcock.

Voted, That Henry Delano Kennard, of Peabody, be restored to the privileges of membership.

The Librarian, Dr. Brigham, presented his report.

The Committee on Nominations reported a list of candidates for the offices of the Society for the ensuing year, and the same were elected by ballot :

President . .	George E. Francis, of Worcester.
Vice-President .	Stephen W. Hayes, of New Bedford.
Treasurer . .	Edward M. Buckingham, of Boston.
Corresponding Sec'y	Charles W. Swan, of Brookline.
Recording Secretary	Francis W. Goss, of Roxbury.
Librarian . .	Edwin H. Brigham, of Brookline.

Herbert L. Burrell, of Boston, was chosen Orator for the annual meeting of the Society in 1903.

Voted, That the next annual meeting of the Society be held in Boston on the second Wednesday in June, 1903.

The following Standing Committee were appointed:

Of Arrangements.

W. H. Prescott, J. C. Hubbard, A. P. Perry,
F. G. Balch. Farrar Cobb, G. S. C. Badger.

On Publications.

O. F. Wadsworth, G. B. Shattuck, H. L. Burrell.

On Membership and Finance.

E. G. Cutler, L. R. Stone, F. W. Goss,
W. Ela, C. M. Green.

To Procure Scientific Papers.

A. K. Stone, C. F. Withington, J. B. Blake,
G. L. Richards, B. P. Croft.

On Ethics and Discipline.

F. C. Shattuck, C. G. Carlton, E. Cowles,
J. F. A. Adams, L. Wheeler.

On Medical Diplomas.

H. E. Marion, E. N. Whittier, O. F. Rogers.

On State and National Legislation.

G. E. Francis, H. P. Bowditch, S. D. Presbrey,
S. W. Abbott, B. H. Hartwell.

The following were elected to fill vacancies:

Councillor for Berkshire District, O. S. Roberts.
Councillor for Middlesex South District, Reuben Willis.
Censor for Middlesex East District, S. W. Kelley.

A communication was presented from the Medical Society of Pennsylvania, inviting The Massachusetts Medical Society to send a delegate to its approaching meeting.

Voted, To accept the invitation.

Voted, That Dr. J. T. G. Nichols of Cambridge, be appointed delegate.

Adjourned at 6 P.M.

FRANCIS W. GOSS,
Recording Secretary.

The Massachusetts Medical Society.

PROCEEDINGS OF THE SOCIETY.

ANNUAL MEETING.

First Day.

June 10, 1902.

Sectional meetings were held in the Medical Library, Boston, on Tuesday, June 10, 1902, at 2 P.M.

The sections were organized and papers were presented as follows:

SECTION IN MEDICINE.

Dr. Samuel H. Durgin, of Boston . . . . . Chairman.
Dr. Maynard Ladd, of Boston . . . . . Secretary.

Vaccine: Its Method of Preparation.—By Prof. Theobald Smith, of West Roxbury.

Vaccination: The Technique.—By Dr. E. A. Darling, of Cambridge.

Vaccination: Accidents and Untoward Effects.—By Dr. J. H. McCollom, of Boston.

Small-Pox: Its Diagnosis.—By Dr. J. T. Bullard, of New Bedford.

Small-Pox: Management of Epidemics.—By Dr. S. W. Abbott, of Newton.

Small-Pox: Its Medical Treatment.—By Dr. Michael Kelly, of Fall River.

SECTION IN SURGERY.

Dr. Herbert L. Burrell, of Boston . . . . . Chairman.
Dr. John T. Bottomley, of Boston . . . . . Secretary.

Non-Operative and Non-Operable Head Injuries.—By Dr. T. J. Robinson, of Taunton.

Indications for Operation in Head Injuries.—By Dr. E. W. Dwight, of Boston.

Indications for Operation in Head Injury.—By Dr. W. N. Bullard, of Boston.

Gun-shot Wounds of the Head.—By Major L. A. LaGarde, Surgeon, U. S. Army.

Technique and After Care of Operations upon the Cranium.—By Dr. C. L. Scudder, of Boston.

At 8 p.m., the Shattuck Lecture was delivered by Dr. Frank Billings, of Chicago, Ill.

Following the lecture a reception was held.

Second Day.

June 11, 1902.

The Society met in Mechanic Building, Boston, on Wednesday, June 11, 1902, at 9.30 am., for the exercises of the one hundred and twenty-first Anniversary.

The President, Dr. Frank W. Draper, in the chair.

The record of the last annual meeting was read and accepted.

The Secretary read the names of Fellows reported admitted since the last annual meeting, and of those whose deaths had been recorded.

Admissions reported since June 11, 1901.

1901	Aberle, Lillie Anastasia	Jamaica Plain.
1901	Adams, Charles Baker	Pittsfield.
1901	Allen, Horatio Cushing	New Bedford.
1902	Allison, Nathaniel	Boston.
1901	Barry, Emmet William	Witinsville.
1902	Bennett, William Hurlburt	Winchendon.
1901	Blaine, Walter Edward	New Bedford.
1901	Boardman, Albertus Kellogg	New Haven, Conn.
1901	Bonney, Charles Austin, Jr.	New Bedford.
1902	Bragg, Leslie Raymond	Webster.
1901	Breed, Nathaniel Perkins	Salem.

1901	Breed, Nathaniel Pope	Lynn.
1902	Brown, Henry Rienzi	Leominster.
1901	Brown, Melvin James	New Bedford.
1902	Brown, Percy Emerson	Boston.
1902	Brush, Frederic Louis	Boston.
1902	Bryant, John Edmund	Haverhill.
1902	Burley, Benjamin Thomas	Worcester.
1901	Burnham, Joseph Forrest	Lawrence.
1901	Bushnell, Edward Henry	Quincy.
1902	Canedy, Charles Francis	Greenfield.
1901	Capelle, Charles Stanislaus	Roxbury.
1902	Cary, Foster Harrington	Boston.
1902	Cheever, David	Boston.
1902	Christian, Henry Asbury	Boston.
1902	Chrystal, Michael Henry	Ayer.
1901	Clark, Frederic Timothy	Westfield.
1901	Clarke, Genevieve	Cambridge.
1902	Clarke, Louis Henry	Holyoke.
1901	Cleaves, Ezra Eames	Rockport.
1901	Cloudman, Harry Radcliffe	Boston.
1902	Conner, Homer Leigh	Haverhill.
1901	Cowles, Frederick Waterman	West Brookfield.
1901	Coyne, Thomas Joseph	Chelsea.
1901	Cummings, Alvah Cochran	Boston.
1901	Cummings, Morton Everett	Malden.
1902	Cutler, Arthur Hardy	Lawrence.
1902	Dame, Fred Russell	Medford.
1901	Dix, George Alfred	Worcester.
1901	Draper, Alexis Lumb	Dorchester.
1901	Duckering, Florence West	Roxbury.
1902	Dutton, Richard	Wakefield.
1901	Fair, Robert Patrick	Cambridge.
1902	Flagg, Elisha	Boston.
1902	Flynn, John Joseph	Worcester.
1902	French, Warren Kilburn	Worcester.
1901	Gale, Harold Adams	Lynn.
1902	Glidden, Howard Kenneth	Lynn.
1901	Grandison, Wilfred George	Brighton.
1901	Graves, William Phillips	Boston.
1901	Grice, Julia	Boston.
1902	Hall, Walter Davis	Medford.
1901	Hanson, Justus Greely	Northampton.
1901	Hapgood, Lyman Sawin	Cambridge.
1901	Harkins, John Francis	Worcester.
1901	Hart, Joseph Storer	Lincoln.
1901	Hartwell, Arthur Spear	Boston.
1902	Hartwell, Harry Fairbanks	Boston.

1901	Hartwell, William Winn	Malden.
1901	Hatch, Leonard Francis	Lynn.
1901	Hayward, William Frank	East Brookfield.
1902	Hess, Peter William	Boston.
1902	Hewett, William Oakes	Attleborough.
1901	Hills, Charles Everett	South Natick.
1902	Holmes, Edward Fowler	Tewksbury.
1901	Holton, Charles Edward	Bernardston.
1902	Houle, Anselme Ephrem	Turner's Falls.
1902	Hunt, George Eddy	Holyoke.
1902	Hunt, George Pratt	Pittsfield.
1901	Hutchinson, Walter Perkins	Abington.
1902	Jones, Harold Wellington	Boston.
1901	Kearney, John Henry	Fitchburg.
1901	Kelly, Michael	Fall River.
1902	Knight, Charles Sumner	Westborough.
1901	Knowlton, William Thomas	Hubbardston.
1901	Kurth, Gustave Emil	Lawrence.
1901	Lambert, John Henry	Lowell.
1901	Lanoie, Joseph Eugène Eusibe	Fall River.
1901	Leen, Thomas Francis	Charlestown.
1902	Leonard, William Joseph	Springfield.
1902	Lewis, Dwight Milton	Boston.
1902	Lithgow, Robert Alexander Douglas	Beverly.
1901	Lovell, Lucinda Sarah	Boston.
1901	Lowell, Albert Fay	West Gardner.
1901	Lowell, Freeman Lamprey	West Somerville.
1902	McDonald, Samuel James	Brighton.
1901	Mackay, Edward Hart	Clinton.
1901	McKibben, William Watson	Worcester.
1901	McLean, Norman Thomas	Southbridge.
1902	Maguire, Thomas Henry	Dorchester.
1902	Mahony, Francis Ronan	Lowell.
1902	Manix, Edward Tuck	Lynn.
1902	Marvell, Mary Wilbur	Fall River.
1901	Matheson, James Renwick	Roxbury.
1901	Meagher, Michael John	Lowell.
1901	Merritt, Louis Arthur	Bridgewater.
1901	Middleton, Willis Johnson	Quincy.
1902	Miller, Harry William	Taunton.
1901	Millet, Wilfred Antonio	Pittsfield.
1902	Moll, Louis Arthur	Cambridge.
1901	Moore, Philip Patrick	Gloucester.
1902	Moulton, Arthur Bertram	Northampton.
1902	Moxom, Philip Wilfred Travis	Newton Highlands.
1901	Murdock, Frederick William	Brockton.
1902	Murray, Edward Francis	Worcester.

1901	Myers, Laura Theodosia	Allston.
1901	Myrick, Hannah Glidden	Dorchester.
1902	Nay, Winfield Scott	Underhill, Vt.
1902	Newhall, Alden Russell	Lynn.
1901	Newhall, Avery Lester	Lynn.
1902	Nickerson, John Peter	West Harwich.
1902	Nicol, Philippe Henri	Worcester.
1901	Nolan, Frank Wesley	Greenfield.
1902	Nolen, Walter Freeman	Brookline.
1901	Noyes, Wilbur Fiske	Pittsfield.
1901	Ober, Marion Helena	Auburndale.
1902	O'Brien, Walter John Leo	South Boston.
1901	O'Connor, John Francis	Worcester.
1902	Osborne, Caroline Amelia	Worcester.
1901	Parcher, George Clarence	Saugus.
1902	Parker, Harry Caldwell	Boston.
1902	Patten, Stephen Kerr	Roxbury.
1902	Pearson, Charles Lusby	Boston.
1901	Phillips, Charles Henry	Beverly.
1901	Pierce, Charles Willard	Allston.
1901	Priest, Herbert Bancroft	Groton.
1902	Putnam, Ralph	Tewksbury.
1902	Reed, Caroline Thyng	Leominster.
1901	Robbins, Elmer Elsworth	New Bedford.
1901	Robertson, Wilbur Burdett	Belmont.
1901	Rockwell, Herbert George	Granville.
1902	Sanborn, George Phippen	Brookline.
1901	Schroeder, May Catherine	Boston.
1902	Seelye, Walter Clark	Worcester.
1901	Sever, James Warren	Cambridge.
1902	Shea, Peter Owen	Worcester.
1901	Shine, John Patrick	Holyoke.
1901	Smith, Edward Shepard	Westfield.
1901	Smith, Howard Harry	Boston.
1902	Stack, Charles Francis	Hyde Park.
1902	Stearns, John Warren	Winchester.
1901	Steele, Albert Edward	Worcester.
1901	Sumner, Harry Herbert	Lowell.
1901	Taylor, Frederick Leon	Brookline.
1901	Thayer, Hartley Wales	Newtonville.
1901	Tingley, Louisa Paine	Boston.
1902	Tobey, Edward Nelson	West Somerville.
1901	Townsend, David	Brookline.
1901	Tozier, Charles Herman	Somerville.
1901	Trainor, John Brett	Fall River.
1902	Trudeau, Marc Aurele	Lowell.
1902	Wadsworth, Richard Goodwin	Boston.

1901	Warren, Alva Harding . . .	Everett.
1902	White, Clifford Allen . . .	Northampton.
1901	Wiley, Harriet Mary . . .	Northampton.
1902	Williams, Edward Denison . .	Easthampton.
1901	Wood, Nathaniel Knight . .	Somerville.

Total, 157.

List of Deceased Fellows.

Admitted.	Name.	Residence.	Date of Death.	Age.
1851	Abbot, Oscar Dunreath	Manch't'r, N.H.	Jan. 1, 1902	77
1855	Adams, Zabdiel Boylston	Framingham	May 1, 1902	72
1886	Andrews, William Henry	Springfield	May 19, 1902	47
1882	Conway, James Henry	Woburn	July 2, 1901	47
1854	Cornish, Aaron	New Bedford	Sept. 27, 1901	68
1874	Deane, James Robinson	Newton	Dec. 6, 1901	68
1901	Dresser, Arthur James	Tewksbury	June 12, 1901	28
1896	Edes, Richard Edward	Roxbury	Nov. 25, 1901	32
1898	Fernald, Alberto Francis	Shirley	Feb. 17, 1902	33
1859	Goodell, Jonathan Woodward	Lynn	March 12, 1902	71
1864	Greene, Nathaniel	Jamaica Plain	Feb. 27, 1902	71
1877	Gunter, Adolphus Birum	Charlestown	July 15, 1901	50
1866	Hastings, Benjamin Franklin	Whitman	June 28, 1901	64
1894	Henshaw, George Bridges	Cambridge	Dec. 19, 1901	34
1880	Hines, Francis Edward	Salem	Sept. 30, 1901	48
1884	Homans, John, 2d	Boston	May 4, 1902	45
1843	Jackson, Alexander	Boston	Dec. 12, 1901	82
1884	Kielty, John Daniel	Fitchburg	Aug. 27, 1901	43
1848	King, George	Franklin	April 24, 1902	79
1899	Macdonald, Donald William	Brookline	July 21, 1901	42
1897	Merchant, Harry Alvin	Monson	June 25, 1901	34
1882	Morse, George Mason	Clinton	Sept. 23, 1901	80
1896	Newcomb, Scott Campbell	Walpole	Dec. 31, 1901	30
1865	Paddock, Franklin Kittredge	Pittsfield	July 26, 1901	59
1892	Pero, Joseph Thomas	Indian Orchard	July 17, 1901	34
1885	Prescott, Royal Blood	Nashua, N. H.	Jan. 2, 1902	63
1855	Rice, Joseph Marcus	Worcester	Nov. 11, 1901	74
1844	Russell, Henry	Sandwich	April 6, 1898	84
1874	Smith, Lawrence Sumner	Haverhill	July 2, 1901	49
1851	Spare, John	New Bedford	May 22, 1901	85
1900	Spalter, Charles Marsh	New York, N.Y.	Nov. 7, 1901	27
1889	Stearns, Daniel Waldo	Newton	Jan. 9, 1902	37
1868	Waterman, Thomas	Boston	Dec. 14, 1901	58
1890	Wiley, Alfred Soule	Newton	Dec. 20, 1901	39
1863	Winslow, Joseph Winslow	Easthampton	Feb. 24, 1902	81

Total, 35.

The Treasurer's Report was read.

Notice was given that, as the annual meeting begins at a later hour than formerly, at the next meeting of the Society a motion would be made to annul rule 2 of the Rules and Orders of the

Society, which provides that the Annual Discourse shall be delivered at 12 M.

Voted, That if occasion arise the rule be suspended to-day.

Papers were read as follows :

DEMONSTRATION OF A MODEL OF THE THORACIC AND ABDOMINAL VISCERA MODELED FROM A CADAVER HARDENED IN FORMALIN.—By Dr. John Warren, of Boston.

EMPYEMA IN CHILDREN.—By Dr. F. J. Cotton, of Boston.

General Topic.

THE USE OF ALCOHOL IN MEDICINE.

THE NUTRITIVE VALUE OF ALCOHOL.—By Prof. F. G. Benedict, of Wesleyan University.

THE BASIS FOR THE USE OF ALCOHOL IN THERAPEUTICS.—By Prof. A. R. Cushney, of the University of Michigan.

THE INFLUENCE OF ALCOHOL UPON INFECTION AND ITS USE IN THE TREATMENT OF ACUTE INFECTIOUS DISEASES.—By Dr. S. J. Meltzer, of New York City.

THE COMMON USE OF ALCOHOL AS A BEVERAGE.—By Prof. Graham Lusk, of the University and Bellevue Hospital Medical College.

The following delegates from other State Medical Societies were present:

Maine.—Dr. C. D. Smith.
New Hampshire.—Drs. G. P. Conn, H. L. Smith.

At 12.30 P.M. the Annual Discourse was delivered by Dr. WILLARD S. EVERETT, of Hyde Park.

Voted, That the thanks of the Society be presented to the Orator for his very interesting and instructive address.

At 2 P.M. the Annual Dinner was served to more than one thousand Fellows.

FRANCIS W. GOSS,
Recording Secretary.

TREASURER'S REPORT.

The accounts for the year ending April 15, 1902, are as follows:—

Receipts.

Balance in the Treasury April 15, 1901			$10,925 93
Assessments paid at Annual Meeting		$630 00	
" " to Treasurer		445 00	
" " to District Treasurers —			
Barnstable	$105 00		
Berkshire	305 00		
Bristol North	170 00		
Bristol South	380 00		
Essex North	405 00		
Essex South	545 00		
Franklin	120 00		
Hampden	575 00		
Hampshire	275 00		
Middlesex East	220 00		
Middlesex North	460 00		
Middlesex South	1,415 00		
Norfolk	1,365 00		
Norfolk South	240 00		
Plymouth	250 00		
Suffolk	2,615 00		
Worcester	930 00		
Worcester North	270 00		
	$10,645 00	10,645 00	
Interest Mount Vernon Nat. Bank	157 87		
" Bay State Trust Co.	73 97		
" Savings Banks	141 29		
" United States Bond	400 00		
" Massachusetts Bonds	70 00		
" Annuities Mass. Hospital Life Ins. Co.	816 79		
Total interest	$1,659 92	1,659 92	
Sale of tickets to Annual Dinner		20 00	
Fine for non-attendance at Censors' Meeting		5 00	
		$13,404 92	13,404 92
Total receipts			$24,330 85

Expenses.

Secretary's Expense:—			
Printing	$125 91		
Engrossing	16 70		
Clerical work	15 60		
Postage and incidentals	19 08		
Carried up,	$177 29	177 29	

	Brought up,		$177 29
Librarian's Expense:—			
Printing and library supplies .	$56 62		
Postage, wrappers, & delivering	147 03		
	$203 65		203 65
Treasurer's Expense:—			
Rent of Box, Bay State Trust Co.	$10 00		
Carriage of books to ann'l meeting	2 00		
Clerks at annual meeting .	30 00		
Printing, postage, and revenue stamps	106 70		
	$148 70		148 70
District Treasurers' Expense . . .			630 08
Censors' Expense			534 00
Supervisors' Expense			10 31
Committee on Publications . . .			1,168 98
Committee on Ethics and Discipline .			19 00
Publication on Animal Experimentation			150 00
Shattuck Lecture			201 25
Cotting Lunch			86 25
Annual Meeting:—			
Invitations, tickets, and printing	$65 40		
Clerk and typewriter . . .	16 60		
Stenographers . . .	25 00		
Symphony Hall . . .	420 00		
Chickering Hall . . .	55 00		
Building platform and ticket office	21 00		
Tables and chairs . . .	10 00		
Cartage	3 15		
Card signs	8 55		
Men at coat room . .	3 00		
Towels and soap . . .	3 00		
Police	5 79		
Music	46 00		
Piano	6 00		
Flowers	50 00		
Caterer	1,953 48		
Cigars	186 50		
Incidentals . . .	14 65		
	$2,893 12		2,893 12
Use of Medical Library; share of expense			750 00
Salaries			1,400 00
Overpaid assessments, less the commissions			14 50
Exchange on checks from out of the State			.50
Annual dividend			4,000 00
Total expenses . . .			$12,387 13 12,387 13
Balance in treasury April 15, 1902 . . .			$11,943 72

The permanent investments of the Society are as follows:—

Cotting Fund:—		
Roxbury Institution for Savings	$1,000 00	
Provident Institution for Savings	1,000 00	
Suffolk Savings Bank	1,000 00	
	$3,000 00	$3,000 00
Shattuck Fund:—		
Certificate of Mass. Hospital Life Ins. Co.		9,166 87
Phillips Fund:—		
United States Bond 4%.		10,000 00
Permanent Fund:—		
Certificate of Mass. Hospital Life Ins. Co.	$11,253 30	
Franklin Savings Bank	1,074 48	
Two $1,000 Massachusetts 3½% Bonds	2,000 00	
	$14,327 78	14,327 78
Total		$36,494 65

EDWARD M. BUCKINGHAM,
Treasurer.

The undersigned, a duly appointed committee, having examined the books of the Treasurer, find them correctly cast and properly vouched, and also that he has in his possession the various securities called for.

HENRY W. BROUGHTON,
MALCOLM STORER.

BOSTON, MAY 21, 1902.

Officers of the Massachusetts Medical Society.

1902—1903.

Chosen June 10, 1902.

George E. Francis, . . . Worcester, . President.
Stephen W. Hayes, . . . New Bedford, Vice-President.
Edward M. Buckingham, . Boston, . . Treasurer.
Charles W. Swan, ... Brookline, . Cor. Secretary.
Francis W. Goss, ... Roxbury, . Rec. Secretary.
Edwin H. Brigham, . . . Brookline, . Librarian.

Standing Committees.

Of Arrangements.

W. H. Prescott, J. C. Hubbard, A. P. Perry,
F. G. Balch, Farrar Cobb, G. S. C. Badger.

On Publications.

O. F. Wadsworth, G. B. Shattuck, H. L. Burrell.

On Membership and Finance.

E. G. Cutler, L. R. Stone, F. W. Goss,
W. Ela, C. M. Green.

To Procure Scientific Papers.

A. K. Stone, C. F. Withington, J. B. Blake,
G. L. Richards, B. P. Croft.

On Ethics and Discipline.

F. C. Shattuck, C. G. Carleton. E. Cowles,
J. F. A. Adams, L. Wheeler.

On Medical Diplomas.

H. E. Marion, E. N. Whittier, O. F. Rogers.

On State and National Legislation.

G. E. Francis, H. P. Bowditch, S. D. Presbrey,
S. W. Abbott, B. H. Hartwell.

Presidents of District Societies—Vice-Presidents (Ex-Officiis).

[Arranged according to seniority.]

T. M. Rotch,
S. B. Woodward,
C. W. Haddock,
J. C. Fraser,
C. F. Withington,
J. F. Croston,
C. R. Gardner,
J. H. Averill,
C. E. Bigelow,
C. S. Holden,
E. G. Hoitt,
J. A. Gage,
S. C. Burton,
J. W. Coughlin,
E. S. Jack,
S. A. Mahoney,
E. M. Parker,
H. G. Stetson.

Councillors.

Barnstable.—I. O. Cummings, Brewster; H. B. Hart, East Dennis.

Berkshire.—J. F. A. Adams, Pittsfield; O. J. Brown, H. Bushnell, North Adams; W. W. Leavitt, O. S. Roberts, Pittsfield.

Bristol North.—C. A. Atwood, S. D. Presbrey, T. J. Robinson, Taunton.

Bristol South.—W. A. Dolan, J. H. Gifford, J. H. Jackson, Fall River; G. deN. Hough, C. A. Pratt, J. F. Weeks, New Bedford.

Essex North.—G. M. Atwood, Bradford; C. E. Birtwell, Lawrence; C. C. Day, Newburyport; J. A. Douglass, Amesbury; C. E. Durant, Haverhill; J. G. McAllister, Lawrence; A. H. Peirce, West Newbury; J. F. Young, Newburyport.

Essex South.—F. W. Baldwin, Danvers; C. H. Bangs, Lynn; H. J. Hall, Marblehead; F. L. Judkins, Lynn; J. H. Knowles, Gloucester; H. W. Mitchell, Hathorne; H. W. Newhall, Lynn; P. C. Proctor, Gloucester; J. Shanahan, Peabody; J. E. Simpson, B. R. Symonds, Salem; M. C. Smith, Lynn.

Franklin.—G. P. Twitchell, A. C. Walker, Greenfield.

Hampden.—T. F. Breck, L. S. Brooks, F. W. Chapin, W. H. Deane, Springfield; L. J. Gibbs, Chicopee Falls; C. W. Jack-

son, Monson ; D. E. Keefe, P. Kilroy, F. B. Sweet, G. D. Weston, R. P. Weiser, G. L. Woods, Springfield.

Hampshire.—A. C. Cobb, Southampton ; R. E. Dickson, Granby ; G. W. Rawson, Amherst ; H. T. Shores, Northampton ; F. H. Smith, Hadley.

Middlesex East.—D. T. Buzzell, Wilmington ; C. E. Chase, Woburn ; J. W. Heath, Wakefield ; G. N. P. Mead, Winchester.

Middlesex North.—R. E. Bell, F. W. Chadbourne, W. A. Johnson, J. E. Lamoureux, W. P. Lawler, M. E. Newcomb, O. P. Porter, C. E. Simpson, Lowell ; G. A. Harlow, Tyngsboro'.

Middlesex South.—D. E. Baker, Newtonville ; R. E. Brown, Everett ; J. E. Cleaves, Medford ; C. H. Cook, Natick ; E. Cowles, Waverley ; J. G. Dearborn, Charlestown ; A. G. Griffin, Malden ; E. A. Hobbs, South Framingham ; E. G. Hoitt, Marlboro' ; E. D. Hooker, Arlington ; R. P. Loring, Newton Centre ; H. B. McIntire, Cambridge ; H. P. Makechnie, West Somerville ; H. E. Marion, Brighton ; J. T. G. Nichols, A. L. Norris, Cambridge ; G. A. Oviatt, South Sudbury ; W. A. Phipps, Hopkinton ; C. E. Prior, Malden ; C. D. Sawin, Charlestown ; F. M. Sherman, L. R. Stone, Newton ; S. G. Soules, Hudson ; E. H. Stevens, H. P. Walcott, A. C. Webber, M. Wyman, Cambridge ; J. W. Willis, H. A. Wood, Waltham ; R. Willis, Somerville.

Norfolk.—F. R. Abbe, Dorchester ; H. D. Arnold, Roxbury ; E. E. Bancroft, Wellesley ; F. A. Bragg, Foxboro' ; J. E. Butler, Roxbury ; H. M. Cutts, F. H. Davenport, F. P. Denny, Brookline ; F. C. Dunbar, G. H. French, Roxbury ; I. S. Fogg, Norwood ; D. H. Fuller, Jamaica Plain ; I. H. Hazelton, Wellesley Hills ; A. D. Hodges, Roxbury ; G. W. Kaan, Brookline ; E. B. Lane, Dorchester ; J. S. H. Leard, Jamaica Plain ; E. N. Libby, E. G. Morse, Roxbury ; R. M. Merrick, W. Noyes, Dorchester ; W. T. Patch, Roxbury ; A. P. Perry, Jamaica Plain ; L. A. Roberts, Dorchester ; E. P. Starbird, Roxbury ; W. N. Tenney, Canton ; A. G. Williams, Brookline ; E. C. Wylie, Dorchester.

Norfolk South.—C. S. Adams, Wollaston ; N. S. Hunting, Quincy ; E. N. Mayberry, V. M. Tirrell, South Weymouth.

Plymouth.—H. W. Dudley, Abington ; E. D. Hill, Plymouth ;

N. K. Noyes, Duxbury; A. E. Paine, F. J. Ripley, Brockton; F. G. Wheatley, North Abington.

SUFFOLK.—J. B. Ayer, E. H. Bradford, E. M. Buckingham, *Treasurer*, H. L. Burrell, J. F. Bush, A. T. Cabot, B. F. Campbell, D. W. Cheever, A. Coolidge, Jr., E. G. Cutler, H. Derby, F. W. Draper, T. W. Fisher, R. H. Fitz, C. F. Folsom, W. W. Gannett, C. M. Green, F. B. Harrington, J. Homans, B. J. Jeffries, G. F. Jelly, F. I. Knight, A. L. Mason, J. H. McCollom, A. B. Morong, F. G. Morrill, A. H. Nichols, C. B. Porter, A. Post, J. J. Putnam, W. L. Richardson, T. M. Rotch, G. H. M. Rowe, F. C. Shattuck, G. B. Shattuck, A. K. Stone, J. B. Swift, H. F. Vickery, O. F. Wadsworth, J. C. Warren, J. C. White, E. N. Whittier, H. Williams, G. Wolcott, Boston; M. F. Gavin, South Boston; J. M. Putnam, Chelsea.

WORCESTER.—W. P. Bowers, Clinton; P. P. Comey, W. Davis, O. H. Everett, G. E. Francis, *President*, T. H. Gage, Worcester; E. B. Harvey, Westboro'; S. P. Holbrook, East Douglas; J. O. Marble, H. M. Quinby, Worcester; W. G. Reed, Southbridge; E. W. Norwood, E. R. Wheeler, Spencer; E. V. Scribner, L. Wheeler, A. Wood, S. B. Woodward, Worcester.

WORCESTER NORTH.—J. R. Greenleaf, Gardner; B. H. Hartwell, Ayer; C. H. Rice, F. H. Thompson, Fitchburg.

Censors.

BARNSTABLE.—I. O. Cummings, *Supervisor*, Brewster; S. T. Davis, Orleans; G. W. Doane, Hyannis: R. H. Faunce, Sandwich; S. Pitcher, Hyannis.

BERKSHIRE.—H. Bushnell, North Adams; H. Colt, W. W. Leavitt, *Supervisor*, W. M. Mercer, Pittsfield; W. W. Scofield, Dalton.

BRISTOL NORTH.—A. S. Deane, F. A. Hubbard, J. B. Murphy, S. D. Presbrey, *Supervisor*, Taunton; A. M. Round, Norton.

BRISTOL SOUTH.—S. W. Bowen, D. E. Cone, W. A. Dolan, *Supervisor*, Fall River; E. W. Dehu, A. M. Pierce, New Bedford.

ESSEX NORTH.—C. E. Durant, *Supervisor*, Haverhill; W. W.

Pillsbury, Newburyport; W. J. Sullivan, Lawrence; F. E. Sweetsir, Merrimac; L. J. Young, Haverhill.

Essex South.—F. F. Brigham, M. A. Harmon, Lynn; S. F. Quimby, B. R. Symonds, *Supervisor*, Salem; F. E. Stone, Lynn.

Franklin.—E. G. Best, Turner's Falls; J. W. Cram, Colrain; G. R. Fessenden, Ashfield; A. C. Walker, *Supervisor*, Greenfield; N. P. Wood, Northfield.

Hampden.—C. A Allen, Holyoke; R. P. M. Ames, D. E. Keefe, H. W. VanAllen, G. L. Woods, *Supervisor*, Springfield.

Hampshire.—A. C. Cobb, *Supervisor*, Southampton; S. A. Clark, J. C. Fahey, Northampton; J. G. Hayes, Williamsburg; W. P. Stutson, Cummington.

Middlesex East.—M. A. Cummings, Winchester; S. W. Kelley, A. C. Lane, Woburn; G. N. P. Mead, *Supervisor*, Winchester; G. W. Nickerson, Stoneham.

Middlesex North.—J. B. Field, T. F. Harrington, S. J. Johnson, G. E. Pinkham, C. E. Simpson, *Supervisor*, Lowell.

Middlesex South.—O. W. Collins, South Framingham; F. G. Curtis, West Newton; W. Preble, Cambridge; C. D. Sawin, *Supervisor*, Charlestown; J. Tolman, Arlington.

Norfolk.—H. M. Cutts, *Supervisor*, Brookline; C. G. Dewey, Dorchester; G. H. Francis, Brookline; H. R. Hitchcock, Hyde Park; G. B. Stevens, Roxbury.

Norfolk South.—W. A. Drake, North Weymouth; F. C. Granger, Randolph; J. A. Gordon, J. F. Welch, Quincy; E. N. Mayberry, *Supervisor*, South Weymouth.

Plymouth.—J. E. Bacon, H. F. Borden, W. P. Chisholm, Brockton; C. A. Drew, Bridgewater; F. J. Ripley, *Supervisor*, Brockton.

Suffolk.—F. G. Balch, A. Coolidge, Jr., *Supervisor*, H. Jackson, H. A. Lothrop, G. H. Washburn, Boston.

Worcester.—O. H. Everett, M. F. Fallon, H. Gage, E. V. Scribner, *Supervisor*, Worcester; C. L. French, Clinton.

Worcester North.—J. G. Henry, Winchendon; A. P. Mason, Fitchburg; E. A. Sawyer, Gardner; F. H. Thompson, *Supervisor*, Fitchburg; G. B. Underwood, West Gardner.

Commissioners of Trials.

Barnstable	L. Edmonds	Harwich.
Berkshire	A. T. Wakefield	Sheffield.
Bristol North	F. A. Hubbard	Taunton.
Bristol South	H. S. Swan	Middleboro'.
Essex North	F. A. Howe	Newburyport.
Essex South	J. Allen	Topsfield.
Franklin	C. Bowker	Bernardston.
Hampden	J. P. Schneider	Palmer.
Hampshire	C. F. Branch	Amherst.
Middlesex East	A. F. Amadon	Melrose.
Middlesex North	W. B. Jackson	Lowell.
Middlesex South	E. R. Cutler	Waltham.
Norfolk	F. P. Emerson	Roxbury.
Norfolk South	N. S. Hunting	Quincy.
Plymouth	G. Osgood	Rockland.
Suffolk	F. W. Draper	Boston.
Worcester	C. H. Perry	Worcester.
Worcester North.	A. W. Sidney	Fitchburg.

Officers of the District Medical Societies.

Barnstable.—E. M. Parker, South Yarmouth, *President;* S. F. Haskins, Cotuit, *Vice-President;* J. H. Higgins, Marston's Mills, *Secretary;* C. W. Milliken, Barnstable, *Treasurer.*

Berkshire.—S. C. Burton, Pittsfield, *President;* L. T. Ingham, West Stockbridge, *Vice-President;* L. C. Swift, Pittsfield, *Secretary*; W. L. Paddock, Pittsfield, *Treasurer;* W. W. Leavitt, Pittsfield, *Librarian.*

Bristol North.—C. S. Holden, Attleboro', *President;* W. Y. Fox, Taunton, *Vice-President;* R. D. Dean, Taunton, *Secretary;* W. Y. Fox, Taunton, *Treasurer;* H. B. Baker, Dighton, *Librarian.*

Bristol South.—J. W. Coughlin, Fall River, *President;* J. C. Pothier, New Bedford, *Vice-President;* A. J. Abbe, Fall River, *Secretary and Treasurer.*

Essex North.—J. F. Croston, Haverhill, *President;* H. G. Leslie, Amesbury, *Vice-President;* M. D. Clarke, Haverhill, *Secretary and Treasurer.*

Essex South.—C. W. Haddock, Beverly, *President;* E. L. Peirson, Salem, *Vice-President;* H. E. Sears, Beverly, *Secretary;* C. Z. Goodell, Salem, *Treasurer;* G. K. Blair, Salem, *Librarian.*

Franklin.—H. G. Stetson, Greenfield, *President;* F. J. Canedy, Shelburne Falls, *Vice-President;* B. P. Croft, Greenfield, *Secretary and Treasurer.*

Hampden.—S. A. Mahoney, Holyoke, *President;* J. W. Hannum, Ludlow, *Vice-President;* H. C. Martin, Springfield, *Secretary and Treasurer.*

Hampshire.—C. R. Gardner, Northampton, *President;* A. G. Blodgett, Ware, *Vice-President;* A. G. Minshall, Northampton, *Secretary;* A. H. Hoadley, Northampton, *Treasurer;* C. Seymour, Northampton, *Librarian.*

Middlesex East.—E. S. Jack, Melrose, *President;* M. A. Cummings, Winchester, *Vice-President;* H. G. Blake, Woburn, *Secretary;* C. Dutton, Wakefield, *Treasurer.*

Middlesex North.—J. A. Gage, Lowell, *President;* B. R. Benner, Lowell, *Vice-President;* W. G. Eaton, Lowell, *Secretary;* J. V. Meigs, Lowell, *Treasurer;* D. N. Patterson, Lowell, *Librarian.*

Middlesex South.—E. G. Hoitt, Marlboro', *President;* A. Worcester, Waltham, *Vice-President;* A. August, Cambridge, *Secretary;* W. Ela, Cambridge, *Treasurer;* E. S. Dow, Allston, *Librarian.*

Norfolk.—C. F. Withington, Roxbury, *President;* W. Channing, Brookline, *Vice-President;* J. C. D. Pigeon, Roxbury, *Secretary and Librarian;* E. G. Morse, Roxbury, *Treasurer.*

Norfolk South.—J. C. Fraser, East Weymouth, *President;* W. A. Drake, North Weymouth, *Vice-President;* S. W. Ellsworth, Quincy, *Secretary, Treasurer and Librarian.*

Plymouth.—J. H. Averill, Campello, *President;* W. P. Chisholm, Brockton, *Vice-President;* F. H. Burnett, Brockton, *Secretary and Treasurer;* C. E. Lovell, Whitman, *Librarian.*

Suffolk.—T. M. Rotch, Boston, *President;* A. T. Cabot, Boston, *Vice-President;* F. J. Cotton, Boston, *Secretary;* W. H. Prescott, Boston, *Treasurer;* B. J. Jeffries, Boston, *Librarian.*

WORCESTER.—S. B. Woodward, Worcester, *President;* W. P. Bowers, Clinton, *Vice-President;* G. E. Emery, Worcester, *Secretary;* G. O. Ward, Worcester, *Treasurer;* A. C. Getchell, Worcester, *Librarian.*

WORCESTER NORTH.—C. E. Bigelow, Leominster, *President;* H. P. Hall, Leominster, *Vice-President;* W. F. Sawyer, Fitchburg, *Secretary;* E. L. Fiske, Fitchburg, *Treasurer;* A. P. Mason, Fitchburg, *Librarian.*

The Massachusetts Medical Society.

PROCEEDINGS OF THE COUNCILLORS.

October 1, 1902.

A Stated Meeting of the Councillors was held in the Medical Library, Boston, on Wednesday, October 1, 1902, at 12, noon.

The Vice-President, Dr. S. W. Hayes, in the chair.

The following Councillors were present:

Bristol North.
S. D. Presbrey.

Bristol South.
W. A. Dolan,
J. H. Gifford.

Essex South.
C. H. Bangs,
F. L. Judkins,
H. W. Mitchell,
P. C. Proctor,
J. Shanahan,
M. C. Smith,
B. R. Symonds.

Hampden.
F. W. Chapin.

Middlesex East.
C. E. Chase,
G. N. P. Mead.

Middlesex North.
W. P. Lawler.

Middlesex South.
R. E. Brown,
J. E. Cleaves,
C. H. Cook,
E. Cowles,
A. G. Griffin,
E. A. Hobbs,
E. G. Hoitt,
E. D. Hooker,
H. B. McIntire,
H. P. Makechnie,
H. E. Marion,
J. T. G. Nichols,
G. A. Oviatt,
L. R. Stone,
H. P. Walcott,
J. W. Willis,
R. Willis,
M. Wyman.

Norfolk.
F. R. Abbe,
E. E. Bancroft,
F. A. Bragg,
J. E. Butler,
F. H. Davenport,
F. C. Dunbar,
G. H. French,
A. D. Hodges,
G. W. Kaan,
E. B. Lane,
J. H. S. Leard,
E. G. Morse,
W. T. Patch,
A. P. Perry,
L. A. Roberts,
E. P. Starbird,
A. G. Williams.

Norfolk South.
C. S. Adams,
V. M. Tirrell.

Plymouth.
H. W. Dudley,
A. E. Paine,
F. G. Wheatley.

Suffolk.

J. B. Ayer,
E. H. Bradford,
E. M. Buckingham,
J. F. Bush,
A. Coolidge, Jr.,
E. G. Cutler,
F. W. Draper,
R. H. Fitz,
C. F. Folsom,
C. M. Green,
F. B. Harrington,
A. L. Mason,
J. H. McCollom,
A. B. Morong,
A. H. Nichols,
C. B. Porter,
J. M. Putnam,
W. L. Richardson,
G. H. M. Rowe,
F. C. Shattuck,
A. K. Stone,
J. B. Swift,
J. C. Warren,
H. Williams,
G. Wolcott.

Worcester.

W. Davis,
E. B. Harvey,
S. P. Holbrook,
E. W. Norwood,
E. V. Scribner,
L. Wheeler.

Worcester North.

J. R. Greenleaf,
B. H. Hartwell,
C. H. Rice,
F. H. Thompson.

Total, 89.

The record of the last meeting was read and accepted.

The following were appointed Delegates to other State Medical Societies :

Vermont.—F. W. Russell, of Winchendon ; G. P. Twitchell, of Greenfield.

New York.—F. W. Draper, of Boston ; J. C. Irish, of Lowell.

New York State Medical Association.—H. P. Walcott, of Cambridge ; Abner Post, of Boston.

The Commitee on Membership and Finance reported through Dr. Cutler. In accordance with their recommendation, it was voted that the following be allowed to resign :

Lillie A. Bartols, of Jamaica Plain.
David W. Byers, of Boston.
Francis E. Corey, of Alhambra, Cal.
Ambrose H. Harding, of Guilford, Me.
William A. Jackson, Jr., of Atlanta, Ga.
Delos B. Manchester, of Oneonta, N. Y.

Also that the following be placed on the retired list :

James P. Prince, of Durban, South Africa.
Arthur Ricketson, of New Bedford.

Also that the following be deprived of the privileges of membership under By-Law VIII. for non-payment of dues :

Edward H. Abbe, of New Bedford.
Roger T. Atkinson.

William H. Bertram, of East Boston.
Samuel C. Bridgham, of Pasadena, Cal.
Ransford D. Canedy, of North Adams.
George B. Coon, of East Walpole.
John N. Coghlan, of Holyoke.
James H. Dennis, of Worcester.
Frank E. Draper, of Boston.
Charles L. Gibson, of New York, N. Y.
Clarence M. Godding, of Providence, R. I.
Daniel Goodenow, of Maynard.
George C. Hall, of Chelsea.
George Holbrook, of Waterbury, Conn.
Chauncey A. Jacobs, of Brookline.
James N. Keniston, of Middletown, Conn.
Arthur T. Mann, of Minneapolis, Minn.
Victor Mignault, of Lawrence.
Flora E. F. Moody, of Springfield.
Lois L. Nelson, of San Francisco, Cal.
Otis K. Newell.
Safier R. Rohrer, of Collinsville.
Edwin W. Ryerson, of Chicago, Ill.
Herbert K. Stiles, of Somerville.
Eddy B. Swett, of Goffstown Centre, N. H.
John McQ. Thompson, of Dorchester.
Charles D. Underhill, of Boston.

Also that the following be restored to the privileges of membership:

Patrick Henry Keefe, of Providence, R. I.

Dr. Wyman offered the following:

Moved, That an Index of the Medical Communications of The Massachusetts Medical Society be compiled, printed and distributed to the members.

Voted, That the matter be referred to the Committee on Publications, with full powers.

Voted, That Dr. H. W. Newhall, of Lynn, be appointed to fill a vacancy in the Committee On Medical Diplomas, caused by the death of Dr. Whittier.

Adjourned at 12.45 P.M.

FRANCIS W. GOSS,
Recording Secretary.

February 4, 1903.

A Stated Meeting of the Councillors was held in the Medical Library, Boston, on Wednesday, February 4, 1903, at 12, noon.

The President, Dr. George E. Francis, in the chair.

The following Councillors were present:

Essex North.
J. A. Douglass.

Essex South.
C. H. Bangs,
F. L. Judkins,
H. W. Newhall,
P. C. Proctor,
J. Shanahan,
M. C. Smith.

Franklin.
G. P. Twitchell.

Middlesex South.
R. E. Brown,
J. E. Cleaves,
C. H. Cook,
A. G. Griffin,
E. A. Hobbs,
E. G. Hoitt,
E. D. Hooker,
H. P. Makechnie.
J. T. G. Nichols,
A. L. Norris,
C. E. Prior,
F. M. Sherman,
E. H. Stevens,
L. R. Stone,
H. P. Walcott,
J. W. Willis,
R. Willis.

Norfolk.
F. R. Abbe,
E. E. Bancroft,
F. A. Bragg,
J. E. Butler,
H. M. Cutts,
F. P. Denny,
G. H. French,
D. H. Fuller,
A. D. Hodges,
G. W. Kaan,
E. B. Lane,
J. H. S. Leard,
R. M. Merrick,
E. G. Morse,
W. Noyes,
L. A. Roberts,
E. P. Starbird,
A. G. Williams.

Norfolk South.
C. S. Adams,
V. M. Tirrell.

Plymouth.
A. E. Paine,
F. G. Wheatley.

Suffolk.
J. B. Ayer,
E. M. Buckingham,
J. F. Bush,
D. W. Cheever,
E. G. Cutler,
R. H. Fitz,
C. F. Folsom,
F. B. Harrington,
A. L. Mason,
J. H. McCollom,
A. B. Morong,
A. H. Nichols,
C. B. Porter,
J. M. Putnam,
W. L. Richardson,
T. M. Rotch,
G. H. M. Rowe,
G. B. Shattuck,
H. F. Vickery,
O. F. Wadsworth,
J. C. Warren,
J. C. White,
H. Williams,
G. Wolcott.

Worcester.
P. P. Comey,
G. E. Francis,
E. W. Norwood,
S. B. Woodward.

Worcester North.
J. R. Greenleaf,
B. H. Hartwell,
F. H. Thompson.

Total, 78.

The record of the last meeting was read and accepted.

The following were appointed Delegates to other Medical Societies:

American Medical Association, 1903 and 1904.—W. N. Swift, of New Bedford; A. G. Minshall, of Northampton; B. H. Hartwell, of Ayer.

Alternates.—J. A. Gordon, of Quincy; H. D. Arnold, of Roxbury; J. L. Goodale, of Boston.

Maine.—E. E. Bancroft, of Wellesley; W. Y. Fox, of Taunton.

New Hampshire.—R. T. Edes, of Jamaica Plain; W. P. Bowers, of Clinton.

Rhode Island.—Albert Wood, of Worcester; A. J. Abbe, of Fall River.

Connecticut.—T. F. Breck, of Springfield; L. J. Gibbs, of Chicopee Falls.

New Jersey.—J. J. Putnam, of Boston; E. S. Jack, of Melrose.

The following Committee was appointed:

To Audit the Treasurer's Accounts.—Malcolm Storer, R. P. Loring.

The Committee on Membership and Finance reported through Dr. Cutler. In accordance with their recommendation it was voted that the following be allowed to resign:

Frank A. Ross, of South Berwick, Me.
David R. Steere, of Groton.

Also, that the following be placed on the retired list:

Jesse F. Frisbie, of Newton.
Richard J. P. Goodwin, of Malden.
Silas P. Holbrook, of East Douglas.
William L. Macdonald, of Wellesley Hills.
Edward M. Skinner, of Jamaica Plain.

The Committee on Publications reported through Dr. Wadsworth regarding the matter referred to them with full powers at the last meeting, that they have caused to be compiled an index of the Medical Communications, Library of Practical Medicine and Publications of the Society, that it will be printed, and distributed to the members with the next issue of the Medical Communications.

Dr. Folsom, for the special Committee on Registration of Vital Statistics, reported stating that the matter in Massachusetts is absolutely in the hands of the Secretary of State, and whatever improvements are made must be all accomplished not only by his approval but through his office. As a result of the interest in the subject, the Secretary of State will advise legislation, which

he will probably secure, but not as much will be done in this direction as your Committee would desire or as would satisfy The Massachusetts Medical Society.

The Committee does not deem it expedient to attempt to do anything more at present, but advises waiting in order to see the results of the improved work which will be introduced this year, and with the hope that more will be accomplished in the future.

Voted, To accept the report of the Committee.

Adjourned at 12.45 P.M.

FRANCIS W. GOSS,
Recording Secretary.

JUNE 9, 1903.

THE ANNUAL MEETING of the Councillors was held in the Medical Library, Boston, on Tuesday, June 9, 1903, at 5 P.M.

The President, Dr. GEORGE E. FRANCIS, in the chair.

The following Councillors were present:

Barnstable.
I. O. Cummings,
H. B. Hart.

Berkshire.
J. F. A. Adams,
O. J. Brown,
H. Bushnell,
L. C. Swift.

Bristol North.
A. S. Deane,
S. D. Presbrey,
T. J. Robinson.

Bristol South.
W. A. Dolan,
J. H. Gifford,
G. deN. Hough,
F. E. Stetson,
A. P. Webber.

Essex North.
I. J. Clarke,
J. A. Douglass.

Essex South.
C. H. Bangs,
F. L. Judkins,
P. C. Proctor,
J. Shanahan,
M. C. Smith,
B. R. Symonds.

Franklin.
H. G. Stetson.

Hampden.
R. P. M. Ames,
J. P. Schneider.

Hampshire.
A. M. Belden,
W. J. Collins.

Middlesex East.
C. W. Harlow,
E. S. Jack.

Middlesex North.
G. A. Harlow,
W. P. Lawler,
G. H. A. Leahey,
J. V. Meigs.

Middlesex South.
D. E. Baker,
R. E. Brown,
J. E. Cleaves,
C. H. Cook,
J. G. Dearborn,
A. G. Griffin,
E. A. Hobbs,
E. G. Hoitt,
E. D. Hooker,
H. B. McIntire,
H. P. Makechnie,
H. E. Marion,
J. T. G. Nichols,
A. L. Norris,
G. A. Oviatt,
C. E. Prior,
F. M. Sherman,
E. H. Stevens,
L. R. Stone,

R. Willis,
H. A. Wood.

Norfolk.

F. R. Abbe,
E. E. Bancroft,
B. H. Calkins,
F. H. Davenport,
F. P. Denny,
R. W. Hastings,
A. D. Hodges,
W. C. Kite,
C. D. Knowlton,
J. H. S. Leard,
E. N. Libby,
F. D. Lyon,
R. M. Merrick,
E. G. Morse,
W. Noyes,
A. P. Perry,
L. A. Roberts,
S. E. Stevens,
A. M. Worthington,
E. C. Wylie.

Norfolk South.

C. S. Adams,
V. M. Tirrell.

Plymouth.

H. W. Dudley,
N. K. Noyes,
A. E. Paine,
F. G. Wheatley.

Suffolk.

J. B. Ayer,
E. G. Brackett,
E. H. Bradford,
E. M. Buckingham,
J. F. Bush,
A. T. Cabot,
D. W. Cheever,
E. G. Cutler,
H. Derby,
R. H. Fitz,
C. F. Folsom,
M. F. Gavin,
C. M. Green,
G. F. Jelly,
E. P. Joslin,
F. I. Knight,
J. H. McCollom,
A. B. Morong,
J. C. Munro,
A. H. Nichols,
A. Post,
J. J. Putnam,
J. M. Putnam,
W. L. Richardson,
G. H. M. Rowe,
F. C. Shattuck,
G. B. Shattuck,
A. K. Stone,
J. B. Swift,
H. F. Vickery,
O. F. Wadsworth,
J. C. Warren,
H. Williams,
G. Wolcott.

Worcester.

P. P. Comey,
W. Davis,
J. T. Duggan,
G. E. Francis,
E. B. Harvey,
E. W. Norwood,
H. M. Quinby,
W. G. Reed,
E. V. Scribner,
L. Wheeler,
A. Wood,
S. B. Woodward.

Worcester North.

C. E. Bigelow,
J. R. Greenleaf,
C. H. Rice.

Total, 129.

The record of the last meeting was read and accepted.

The Secretary read the names of new and of deceased Fellows.

The Treasurer, Dr. Buckingham, read his annual report.

The Committee on Membership and Finance reported through Dr. Cutler, and recommended that $4,500.00 of the surplus in the treasury be distributed among the District Societies.

Voted, That the recommendation be adopted.

In accordance with the recommendation of the same Committee it was voted, that the following be allowed to resign :

William E. Baxter, of Boston.
Frederick S. Cate, of Wakefield.
James P. Goray, of Roxbury.
Rufus C. MacDonald, of San Francisco, Cal.
Sydney R. Marvin, of Springfield.
Mary B. Nicola, of Melrose.
Phebe A. Sprague, of Holly, N. J.

Also, that the following be placed on the retired list:

Charles V. Bemis, of Medford.
William W. Eaton, of Danvers.
Joseph B. Kingsbury, of Holbrook.
John Q. A. McCollester, of Waltham.
William B. Mackie, of Boston.
Edward B. Nims, of Springfield.
John E. Parsons, of Ayer.
Charles W. Swan, of Brookline.

The Committee On Publications reported through Dr. Wadsworth.

The Librarian, Dr. Brigham, presented his annual report.

The Committee on Nominations reported a list of candidates for the offices of the Society for the ensuing year, and the same were elected by ballot:

President . .	George E. Francis, of Worcester.
Vice-President .	J. F. Alleyne Adams, of Pittsfield.
Treasurer . .	Edward M. Buckingham, of Boston.
Corresponding Sec'y	Charles W. Swan, of Brookline.
Recording Secretary	Francis W. Goss, of Roxbury.
Librarian . .	Edwin H. Brigham, of Brookline.

Harold C. Ernst, of Jamaica Plain, was chosen Orator for the annual meeting of the Society in 1904.

Voted, That the next annual meeting of the Society be held in Boston on the second Wednesday in June, 1904.

The following Standing Committee were appointed:

Of Arrangements.

F. G. Balch,	Farrar Cobb,	G. S. C. Badger,
J. C. Hubbard,	A. P. Perry,	Lincoln Davis.

On Publications.

O. F. Wadsworth, G. B. Shattuck, H. L. Burrell.

On Membership and Finance.

E. G. Cutler, L. R. Stone, F. W. Goss,
W. Ela, C. M. Green.

To Procure Scientific Papers.

C. F. Withington, J. B. Blake, G. L. Richards,
B. P. Croft, R. C. Larrabee.

On Ethics and Discipline.

C. G. Carleton, E. Cowles, J. F. A. Adams,
L. Wheeler, J. A. Gage.

On Medical Diplomas.

H. E. Marion, O. F. Rogers, H. W. Newhall.

On State and National Legislation.

G. E. Francis, H. P. Bowditch, S. D. Presbrey,
S. W. Abbott, B. H. Hartwell.

The following were elected to fill vacancies:

Supervisor for Middlesex South District, H. B. McIntire.
Censor for Norfolk South District, J. A. Gordon.

Adjourned at 6 P.M.

FRANCIS W. GOSS,
Recording Secretary.

The Massachusetts Medical Society.

PROCEEDINGS OF THE SOCIETY.

ANNUAL MEETING.

First Day.

June 9, 1903.

Sectional meetings were held in the Medical Library, Boston, on Tuesday, June 9, 1903, at 2 P.M.

The sections were organized and papers were presented as follows:

SECTION IN MEDICINE.

Dr. Stephen W. Hayes, of New Bedford . . . Chairman.
Dr. Ralph C. Larrabee, of Boston . . . . . Secretary.

Inferences to be drawn from the Examination of the Contents of the Stomach.—By Dr. E. P. Joslin, of Boston.

The Dietary Treatment of Constipation.—By Dr. H. F. Hewes, of Boston.

Hyperchlorhydria.—By Dr. R. W. Swan, of Worcester.

The Medical Treatment of Gastric Ulcer.—By Dr. H. G. Wilbur, of Fall River.

The Surgical Treatment of Gastric Ulcer.—By Dr. J. C. Munro, of Boston.

SECTION IN SURGERY.

Dr. William A. Dolan, of Fall River . . . . Chairman.
Dr. John T. Bottomley, of Boston . . . . . Secretary.

Rupture of the Quadriceps Extensor Femoris Muscle.—By Dr. H. G. Stetson, of Greenfield.

A Brief summary of the Surgery of the Œsophagus.—By Dr. S. J. Mixter, of Boston.

The Present Status of the Surgery of the Prostate Gland.—By Dr. Paul Thorndike, of Boston.

Cancer of the Intestine—Its Surgical Aspect.—By Dr. Homer Gage, of Worcester.

Minor Surgery in Country Practice. — By Dr. C. S. Chapin, of Great Barrington.

At 8 P.M., the Shattuck Lecture was delivered by Dr. Theobald Smith, of Boston.

Following the lecture a reception was given by the Society, to its President and other Officers.

Second Day.

June 10, 1903.

The Society met in Horticultural Hall, Boston, on Wednesday, June 10, 1903, at 9.00 A.M., for the exercises of the one hundred and twenty-second Anniversary.

The President, Dr. George E. Francis, in the chair.

The record of the last meeting was read and accepted.

The Secretary read the names of Fellows reported admitted since the last annual meeting, and of those whose deaths had been recorded.

Admissions reported since June 10, 1902.

1903	Abbot, Florence Hale	Taunton.
1903	Adams, John Dresser	Boston.
1903	Alexander, Thomas Branch	Scituate.
1903	Allen, Granville Stevens	Lawrence.
1903	Allen, William Howard	Mansfield.
1903	Baff, Max	Worcester.
1903	Baker, George Lorimer	Tewksbury.
1903	Baketel, Roy Vincent	Taunton.
1903	Bancroft, Irving Reed	Allston.
1902	Bartlett, Philip Challis	Worcester.
1903	Bartley, John Joseph	Lawrence.
1902	Belding, John Eastman	Roxbury.
1903	Bergin, Stephen Albert	Worcester.
1903	Binney, Horace	Boston.
1902	Blanchard, Randall Howard	Pittsfield.

1903	Bonnar, James Miller	New Bedford.
1903	Bonney, Robert	East Boston.
1902	Borden, Charles Richardson Cobb	Boston.
1902	Brace, George Welles	Westfield.
1902	Brennan, Joseph Thomas Louis	Lowell.
1903	Brigham, Clarence Sumner	Leominster.
1902	Bruce, Frank Colverd	Easthampton.
1903	Bufford, John Henry	Dorchester.
1902	Bulkeley, Frank Stedman	Ayer.
1903	Butler, Richard Bernard	Fall River.
1903	Caisse, George Emile	Lowell.
1902	Carroll, Thomas Francis	Boston.
1903	Caulfield, Thomas Edward	Woburn.
1902	Chase, Henry Melville, Jr.	Boston.
1902	Chase, Walter Greenough	Brookline.
1903	Cheever, John Howard	Pawtucket, R. I.
1903	Clark, Thomas Francis	Taunton.
1903	Clarke, Elliott Mason	Mansfield.
1902	Clement, Merton Wallace	Worcester.
1902	Cohan, Francis Henry	Leominster.
1903	Collins, Richard	Waltham.
1902	Conro, Arthur Clifton	East Longmeadow.
1903	Cotton, Harry Andrews	Hathorne.
1903	Crofts, Nicholas Matthew	North Adams.
1903	Crosby, Leander Marshall	Wakefield.
1902	Dadmun, Eliza Josephine	Boston.
1903	Dennen, Joseph Horace	Watertown.
1903	Devlin, Peter Clarke	Lynn.
1903	Donaldson, James Frank	Salem.
1902	Dreyfus, Edna Weil	Boston.
1903	Dunn, Charles Hunter	Boston.
1903	Elliott, Alfred	State Farm.
1903	Emerson, Benjamin Kendall, Jr.	Worcester.
1903	Evans, Albert	Boston.
1902	Fish, Ralph Charles	Worcester.
1903	Fisher, Charles Thompson	Worcester.
1902	Fisher, Irving Jewell	West Newton.
1903	Fitzpatrick, John Joseph	Charlestown.
1903	Fleming, Peter Joseph	Lawrence.
1902	Fletcher, Robert Swan	Oxford.
1902	Franz, Adolph	So. Hadley Falls.
1903	Gardner, Archibald Robert	Lowell.
1902	Gardner, Charles Wesley	Boston.
1903	Gay, Herbert Seymour	Boston.
1902	Généreux, Joseph Olivier	Webster.
1902	Gibson, Robert Francis	Boston.
1903	Gleason, George Hathaway	Allston.

1902	Goodridge, Frederick James	Cambridge.
1903	Gould, Alfred Henry	Boston.
1903	Granger, Frank Butler	Randolph.
1903	Gray, Hugh Barr	Chesterfield.
1902	Griffin, Nathan Leroy	Haverhill.
1903	Griffin, Walter Alden	Sharon.
1903	Guild, Alfred Henry	Boston.
1903	Hall, John Baptiste, Jr.	Boston.
1903	Harriman, Cora Elizabeth	Boston.
1902	Harriman, David Eugene	So. Hadley Falls.
1903	Harrington, Michael William	Indian Orchard.
1902	Haskell, Harris Bigelow	Amherst.
1903	Hayes, Wentworth Larrabee	Cambridge.
1903	Haynes, Mabel Stevens	Boston.
1902	Henderson, George Dallas	Holyoke.
1903	Hodgdon, Ralph Franklin	Somerville.
1903	Hodges, Fletcher	Indianapolis, Ind.
1902	Hodskins, Morgan Brewster	Palmer.
1902	Holbrook, Bradbury	West Newton.
1903	Holmberg, Carl Lester Magnus	Campello.
1902	Huckins, Theron Howard	Leominster.
1903	Hunt, Ernest Leroi	Worcester.
1903	Hurwitz, Abraham Joseph	Boston.
1903	Jackson, Howard Bigelow	Concord.
1902	Johnstone, William Joseph	Roxbury.
1903	Jones, Raymond Child	Fitchburg.
1903	Keene, Charles Herbert	Lowell.
1903	Kelley, Daniel Joseph	Worcester.
1903	Kelley, Joseph Henry Hart	Boston.
1902	Knickerbocker, Percy Gates	Allston.
1902	Knight, Charles Lewis	Boston.
1903	Knowlton, Wallace Miles	Brookline.
1903	Konikow, Antonia Buchholz	Boston.
1903	Koplowitz, Abraham	Boston.
1902	Lally, Francis Henry	Worcester.
1902	Levis, Harold James	Fitchburg.
1903	Libby, Mildred Augusta	Baldwinville.
1903	Lilly, Thomas Eugene	Shirley.
1903	Lincoln, Merrick	Worcester.
1903	Loewe, Leonard Joseph	Whitman.
1903	Lootz, Emma	Boston.
1902	Lord, Frederick Taylor	Boston.
1903	Lowd, Harry Mosher	Taunton.
1902	Lowney, John Francis	Fall River.
1902	Lynch, Patrick Michael	Springfield.
1902	McBain, William Hearst	Malden.
1903	McDonald, James William	Worcester.

1903	McGauran, George Daniel	Lawrence.
1903	McHugh, John Francis	Springfield.
1903	McNamara, John James	Brockton.
1903	McPherson, Ross	South Boston.
1903	Magurn, Francis	Charlestown.
1903	Malone, Charles	Jamaica Plain.
1903	Marshall, Augustus Thompson	Dorchester.
1902	Mason, Nathaniel Robert	Boston.
1902	Mayhew, Orlando Smith	Cottage City.
1903	Morgner, Richard August	Lynn.
1903	Murphy, Daniel David	Amesbury.
1902	Murphy, Fred Towsley	Boston.
1903	Myers, Solomon	East Boston.
1903	Nelligan, John Patrick	Cambridge.
1903	Norton, George Edward	Cambridge.
1903	Nye, Harry Royal	Leominster.
1903	O'Brien, Charles Thomas	Worcester.
1903	O'Brien, John Francis	Charlestown.
1902	O'Connor, Dennis Francis	Worcester.
1903	O'Day, George Frederick	Worcester.
1903	O'Donnell, Edmund Emmett	Brockton.
1903	O'Hearn, Daniel Aloysius	Lowell.
1903	Osborne, Ernest Sumner	West Dennis.
1902	O'Toole, Michael James	Worcester.
1902	Parker, Helen Schlesinger	Chestnut Hill.
1903	Penny, Herbert Thomas	Cliftondale.
1902	Pond, Bernard Wesley	Boston.
1903	Pritchard, William Percival	Fall River.
1902	Raynes, Myrton Berry	Melrose Highlands.
1902	Rees, Rees Byron	Boston.
1903	Rice, Robert Astley	Fitchburg.
1903	Rich, Charles Edwin	Lynn.
1903	Richardson, Charles Harper	Pittsfield.
1902	Robbins, Michael Uriah	Newton.
1902	Robertson, Frederick McNaughton	East Milton.
1902	Robinson, Harry Pringle	Tewksbury.
1902	Rollins, Edwin Theodore	Tewksbury.
1902	Rose, William Henry	Worcester.
1903	Scannell, David Daniel	Boston.
1902	Schallenbach, Ernest Bradford	Boston.
1903	Sims, Frederick Robertson	Taunton.
1902	Smith, Forster Hanson	Lowell.
1902	Smith, Theobald	Forest Hills.
1902	Smyser, Charles James	Harwich.
1903	Snow, Frank Whipple	Boston.
1903	Stick, Henry Louis	Worcester.
1902	Stratton, Ralph Ricker	New Bedford.

1903	Sullivan, Florence Augustine	Haverhill.
1902	Tabor, Edward Orlando	Lowell.
1903	Tallant, Alice Weld	Boston.
1903	Thompson, Charles Edward	Tewksbury.
1902	Tileston, Wilder	Boston.
1903	Treston, Maurice Joseph	Pittsfield.
1903	Truesdale, Philemon Edwards	Fall River.
1902	Verhoff, Frederick Herman	Boston.
1902	Walker, David Harold	Boston.
1903	Westall, John	Fall River.
1902	Willard, Frederick Buell	Pittsfield.
1903	Wilson, Louis Thornton	Boston.
1903	Winslow, Frederick Bradlee	Boston.
1902	Woodruff, Richard Allen	Pittsfield.
1902	Woodworth, John Dawson Roswell	Jamaica Plain.
1902	Worth, Edward Philip	Edgartown.
1903	Wynne, Richard	South Boston.
1903	Yeaton, George William	Brookline.

Total, 173.

List of Deceased Fellows.

Admitted.	Name.	Residence.	Date of Death.	Age.
1877	Abbott, John Hammill	Fall River	Nov. 1, 1902	55
1862	Allen, William George	Mansfield	April 5, 1903	69
1859	Ames, Joseph Stanford	Holden	March 25, 1903	74
1880	Baker, Lucius Willard	Baldwinsville.	Dec. 7, 1902	50
1894	Ball, Charles Dickens Evans	Boston	Mar. 29, 1903	44
1885	Bell, Robert	Roxbury	July 4, 1902	57
1877	Bowen, Charles Wesley	Westfield	Oct. 10, 1902	58
1895	Boynton, Edwin Dana	Harrington, Me.	April 26, 1902	29
1858	Brewster, John Milton	Pittsfield	Oct. 15, 1902	84
1886	Brigham, Frank Fontelle	Lynn	Mar. 10, 1903	43
1867	Bubier, Joseph Augustus	Brookline	Nov. 24, 1902	63
1897	Burke, Ernest Gisborne	Quincy	Feb. 18, 1903	30
1870	Carlton, Charles Augustus	Salem	June 12, 1902	61
1876	Chadbourne, Francis Watts	Lowell	Aug. 21, 1902	58
1875	Chase, Charles Edmund	Woburn	Dec. 26, 1902	53
1865	Cleaveland, Daniel Atheam	Hyannis	Feb. 21, 1903	72
1872	Couch, John Francis	Somerville	Jan'y 4, 1903	56
1869	Cushing, Henry Joseph	Merrimac	Nov. 18, 1902	65
1846	Downes, Nathaniel	Boston	Jan'y 8, 1903	84
1854	Garland, Joseph	Gloucester	Sept. 4, 1902	80
1854	Gifford, Silas Swift	Avon	Sept. 18, 1902	78
1897	Hamlin, Charles Franklin	Medway	May 16, 1903	33
1846	Harlow, Edwin Augustus Warren	Wollaston	Oct. 12, 1902	88
1870	Hildreth, William Hartwell	Newton U.Falls	Jan'y 15, 1903	58
1880	Holbrook, William	Palmer	April 27, 1903	79
1882	Holmes, William Dennison	South Braintree	May 21, 1903	42
1862	Homans, John	Boston	Feb. 7, 1903	66
1848	Howe, Charles	Taunton	Feb. 12, 1903	82

1849	Peirce, James	Kingston	Dec.	18,	1902	87
1856	Perry, Edgar	VineyardHaven	April	1,	1903	80
1835	Richards, James Forsaith	Hyde Park	June	18,	1902	49
1875	Richardson, John Henry	Roxbury	Oct.	21,	1902	59
1899	Walsh, Peter Duggan	Pittsfield	March	23,	1903	36
1883	Whittier, Edward Newton	Boston	March	24,	1903	43
1887	Wyman, Morrill	Holyoke	Sept.	8,	1902	43
1879	Jones, Henry Newell	Methuen	Aug.	25,	1902	54
1899	Leach, William	Boston	April	7,	1903	47
1861	Lincoln, John Clifford	Andover	May	13,	1903	70
1856	Mecuen, George Edward	Medfield	July	22,	1902	74
1858	Noyes, Henry Allen	Boston	Aug.	10,	1902	79
1869	Parker, Charles Frederick	Boston	June	14,	1902	60
1837	Patten, Julia Maria	Cambridge	Jan'y	30,	1903	90

Total, 42.

The Treasurer's report was read.

Motion was made in accordance with notice given at the last annual meeting to annul Rule 2 of the Rules and Orders of the Society, which provides that the Annual Discourse shall be delivered at 12 M.

Voted, That the above named Rule be rescinded.

The record of the Board of Trial in the case of Charles A. Peabody, was read.

Voted, That the sentence of the Board of Trial be imposed and that Charles A. Peabody, of Worcester, be and is expelled from his membership of The Massachusetts Medical Society.

Papers were read as follows :

The Effects of Tobacco on the Heart.—By Dr. R. C. Larrabee, of Boston.

Surgery of Chronic Ulcer of the Stomach.—By Dr. F. B. Lund, of Boston.

The Relations existing between Respiratory and Intrapelvic Disease.—By Dr. D. H. Craig, of Boston.

Problems of Clinical Anatomy.—By Dr. Thomas Dwight, of Nahant.

In accordance with the vote of the Councillors, the subject of Privileged Communications was presented :

A Plea for a Change in the Massachusetts Law.—By Dr. D. W. Cheever, of Boston.

The Workings of the New York Law.—By Walter Soren, Esq., of Brookline.

And by title, on account of illness of its author,

PRIVILEGED COMMUNICATIONS TO PHYSICIANS.—By F. J. Stimson, Esq., of Dedham.

Voted, That the thanks of the Society be given to Mr. Soren, for his interesting and valuable paper.

The following delegates from other State Medical Societies were present:

New Hampshire.—Dr. A. C. Heffinger.
Vermont.—Dr. C. S. Hodgkins.
Rhode Island.—Drs. G. S. Mathews, W. F. Gleason.
Connecticut.—Dr. Rienzi Robinson.

At 12 M. the Annual Discourse was delivered by Dr. HERBERT L. BURRELL, of Boston.

Voted, That the thanks of the Society be presented to the Orator for his very interesting and instructive address.

At 1 P.M. the Annual Dinner was served in Symphony Hall to more than one thousand Fellows.

FRANCIS W. GOSS,
Recording Secretary.

ERRATUM.

On page 48 of the Proceedings of 1903, and in the corresponding part of Supplement No. II., the List of Deceased Fellows should be as follows:—

1849	Jones, Henry Newell	Kingston	Dec.	18,	1902	87
1856	Leach, William	Vineyard Haven	April	1,	1903	80
1885	Lincoln, John Clifford	Hyde Park	June	18,	1902	49
1875	Mecuen, George Edward	Roxbury	Oct.	21,	1902	59
1899	Noyes, Henry Allen	Pittsfield	March	23,	1903	36
1883	Parker, Charles Frederick	Boston	March	24,	1903	43
1887	Patten, Julia Maria	Holyoke	Sept.	8,	1902	43
1879	Peirce, James	Methuen	Aug.	25,	1902	54
1899	Perry, Edgar	Boston	April	7,	1903	47
1861	Richards, James Forsaith	Andover	May	13,	1903	70
1856	Richardson, John Henry	Medfield	July	22,	1902	74
1858	Walsh, Peter Duggan	Boston	Aug.	10,	1902	79
1869	Whittier, Edward Newton	Boston	June	14,	1902	60
1837	Wyman, Morrill	Cambridge	Jan'y	30,	1903	90

TREASURER'S REPORT.

The accounts for the year ending April 15, 1903, are as follows:—

Receipts.

Balance from last year in cash			$11,943 22
Assessments paid to District Treasurers —			
Barnstable	$115 00		
Berkshire	290 00		
Bristol North	190 00		
Bristol South	390 00		
Essex North	425 00		
Essex South	545 00		
Franklin	130 00		
Hampden	595 00		
Hampshire	270 00		
Middlesex East	235 00		
Middlesex North	460 00		
Middlesex South	1,415 00		
Norfolk	1,425 00		
Norfolk South	200 00		
Plymouth	270 00		
Suffolk	2,695 00		
Worcester	925 00		
Worcester North	305 00		
	$10,880 00	10,880 00	
Assessments paid at Annual Meeting		765 00	
" " to Treasurer		715 00	
Premiums of Foreign Check		21	
Sale of Extra Dinner Tickets		20 00	
Interest on Bank Deposits		239 16	
" on Savings Bank Deposits		141 29	
" on Bonds		487 50	
" on Annuities, Mass. H. L. Ins. Co.		816 80	
		$26,008 18	
Total receipts			$26,008 18

Expenses.

President's Expense	25 28	
Treasurer's Expense :—		
Stationery, postage, clerks, &c.	96 70	
District Treasurers' Expense :—	659 68	
Librarian's Expense :—		
Stationery and postage	201 88	
Secretary's Expense: —		
Stationery and postage	302 12	
Censors' Expense	450 00	
Supervisors' Expense	8 77	
Salaries	1,400 00	
Overpaid assessments, less commissions	9 75	
Exchange	70	
Carried up,	$3,154 88	

Brought up,		$3,154 88	$26,008 18
Annual Meeting :—			
Stationery and printing tickets	$64 72		
Addressing circulars	15 66		
Stenographers	25 00		
Stereopticon	10 00		
Service	5 00		
Police	6 50		
Towels and soap	3 25		
Band	40 00		
Chairs for Harvard Glee Club, bought by the Society	45 05		
Carriage for Committee of Arrangements	3 00		
Decorators	25 00		
Florist	50 00		
Caterer	2,321 56		
Cooling Appolinaris	3 00		
Cigars	168 50		
Rent of Mechanics Hall	508 00		
Incidentals	8 85		
	$3,303 09	3,303 09	
Shattuck Lecture		201 00	
Committee To Procure Scientific Papers		228 15	
Committee On Publications		1,082 92	
Committee On Ethics		4 50	
Committee On State and National Legislation—printing		32 60	
Catalogue		673 17	
Cotting Lunch		88 00	
Share of Expenses of Medical Library		750 00	
Annual Dividend		4,000 00	
Permanent Fund :—			
Massachusetts 3½ per ct. gold bond due 1941	$1,000 00		
Premium	101 25		
Interest	4 96		
	$1,106 21	1,106 21	
Matting for Holmes Hall		94 35	
Total expenses		$14,718 87	14,718 87
Balance			$11,289 31

On the fifteenth of April, the day on which the financial year of the Society closes, this balance was distributed as follows :—

Deposited in the Mount Vernon National Bank	$6,366 10	
Deposited in the Bay State Trust Co.	5,071 24	
Undrawn interest in the Suffolk Savings Bank	32 76	
Undeposited Check	66 50	
Total	11,536 60	
These last two items became available only on the day that the books closed.		
From this amount must be deducted outstanding checks	247 29	
Balance	$11,289 31	11,289 31

Permanent Investments.

The permanent investments of the Society are as follows :

Deposit Roxbury Institution for Savings (Cotting Fund)	$1000 00
Deposit Provident Institution for Savings (Cotting Fund)	1000 00
Deposit Suffolk Savings Bank (Cotting Fund)	1000 00
United States 4 per cent. Bond (Phillips Fund)	10,000 00
Annuity Mass. Hospital Life Ins. Co. (Shattuck Fund)	9,166 87
Annuity Mass. Hospital Life Ins. Co. (Permanent Fund)	11,253 30
Massachusetts 3½ per cent. gold bonds (Permanent Fund)	3,000 00
Deposit Franklin Savings Bank (Permanent Fund)	1,074 48
Total	$37,494 65

EDWARD M. BUCKINGHAM,
Treasurer.

The undersigned, a duly appointed committee, having examined the books of the Treasurer, find them correctly cast and properly vouched, and also that he has in his possession the socurities called for.

MALCOLM STORER,
ROBERT P. LORING.

BOSTON, MAY 12, 1903.

Officers of the Massachusetts Medical Society.

1903—1904.

Chosen June 9, 1903.

George E. Francis,	Worcester,	President.
J. F. Alleyne Adams,	Pittsfield,	Vice-President.
Edward M. Buckingham,	Boston,	Treasurer.
Charles W. Swan,	Brookline,	Cor. Secretary.
Francis W. Goss,	Roxbury,	Rec. Secretary.
Edwin H. Brigham,	Brookline.	Librarian.

Standing Committees.

Of Arrangements.

F. G. Balch, Farrar Cobb, G. S. C. Badger,
J. C. Hubbard, A. P. Perry, Lincoln Davis.

On Publications.

O. F. Wadsworth, G. B. Shattuck, H. L. Burrell.

On Membership and Finance.

E. G. Cutler, L. R. Stone, F. W. Goss,
W. Ela, C. M. Green.

To Procure Scientific Papers.

C. F. Whitington, J. B. Blake, G. L. Richards,
B. P. Croft, R. C. Larrabee.

On Ethics and Discipline.

C. G. Carleton, E. Cowles, J. F. A. Adams,
L. Wheeler, J. A. Gage.

On Medical Diplomas.

H. E. Marion, O. F. Rogers, H. W. Newhall.

On State and National Legislation.

G. E. Francis, H. P. Bowditch, S. D. Presbrey,
S. W. Abbott, B. H. Hartwell.

Presidents of District Societies—Vice-Presidents (Ex-Officiis).

[Arranged according to seniority.]

F. J. Canedy,
Walter Channing,
A. T. Cabot,
H. P. Hall,
W. P. Bowers,
W. G. Eaton,
J. W. Hannum,
F. S. Atwood,
J. F. Croston,
C. R. Gardner,
S. F. Haskins,
J. H. Averill,
W. A. Drake,
E. G. Hoitt,
W. Y. Fox,
M. A. Cummings,
J. C. Pothier,
M. M. Brown.

Councillors.

Barnstable.—I. O. Cummings, Brewster; H. B. Hart, East Dennis.

Berkshire.—J. F. A. Adams, *Vice-President*, Pittsfield; O. J. Brown, H. Bushnell, North Adams; W. W. Leavitt, L. C. Swift, Pittsfield; A. T. Wakefield, Sheffield.

Bristol North.—C. S. Holden, Attleboro'; A. S. Deane, S. D. Presbrey, T. J. Robinson, Taunton.

Bristol South.—W. A. Dolan, J. H. Gifford, G. L. Richards, Fall River; G. deN. Hough, F. E. Stetson, A. P. Webber, New Bedford.

Essex North.—G. M. Atwood, Bradford; C. E. Birtwell, Lawrence; J. A. Douglass, Amesbury; I. J. Clarke, C. E. Durant, Haverhill; J. G. McAllister, Lawrence; R. B. Root, Georgetown; J. F. Young, Newburyport.

Essex South.—F. W. Baldwin, Danvers; C. H. Bangs, Lynn; C. W. Haddock, Beverly; F. L. Judkins, Lynn; J. H. Knowles, Gloucester; H. W. Mitchell, Hathorne; P. C. Proctor, Gloucester; P. L. Sanborn, Marblehead; J. Shanahan, Peabody; J. E. Simpson, B. R. Symonds, Salem; M. C. Smith, Lynn.

Franklin.—B. P. Croft, H. G. Stetson, Greenfield; N. P. Wood, Northfield.

HAMPDEN.—R. P. M. Ames, T. F. Breck, Springfield; J. L. Bliss, Holyoke; R. Carleton, H. C. Emerson, Springfield; L. J. Gibbs, Chicopee Falls; J. W. Holland, Westfield; S. A. Mahoney, Holyoke; W. C. Leary, L. A. Préfontaine, S. J. Russell, Springfield; J. P. Schneider, Palmer.

HAMPSHIRE.—A. M. Belden, W. J. Collins, J. G. Hanson, Northampton; N. C. Haskell, Amherst; G. W. Hubbard, South Hadley.

MIDDLESEX EAST.—D. C. Dennett, Winchester; G. F. Dow, Reading; C. W. Harlow. E. S. Jack, Melrose.

MIDDLESEX NORTH.—R. E. Bell, J. A. Gage, J. E. Lamoureux, W. P. Lawler, G. H. A. Leahey, J. V. Meigs, O. P. Porter, C. E. Simpson, Lowell; G. A. Harlow, Tyngsboro'.

MIDDLESEX SOUTH.—D. E. Baker, Newtonville; R. E. Brown, Everett; T. Chamberlin, Concord; J. E. Cleaves, Medford; C. H. Cook, Natick; E. Cowles, Waverley; J. G. Dearborn, Charlestown; A. G. Griffin, Malden; J. L. Hildreth, Cambridge; E. A. Hobbs, South Framingham; E. G. Hoitt, Marlboro'; E. D. Hooker, Arlington; R. P. Loring, Newton Centre; H. B. McIntire, Cambridge; H. P. Makechnie, West Somerville; H. E. Marion, Brighton; J. T. G. Nichols, A. L. Norris, Cambridge; G. A. Oviatt, South Sudbury; C. E. Prior, Malden; C. D. Sawin, Charlestown; F. M. Sherman, L. R. Stone, Newton; S. G. Soules, Hudson; E. H. Stevens, H. P. Walcott, A. C. Webber, Cambridge; J. W. Willis, H. A. Wood, Waltham; R. Willis, Somerville.

NORFOLK.—F. R. Abbe, Dorchester; E. E. Bancroft, Wellesley, B. H. Calkins, Jamaica Plain; F. H. Davenport, F. P. Denny, Brookline; G. H. French, A. D. Hodges, C. D. Knowlton, Roxbury; D. Graham, R. W. Hastings, Brookline; O. H. Hubbard, Needham; W. C. Kite, Milton; J. S. H. Leard, Jamaica Plain; E. N. Libby, F. D. Lyon, E. G. Morse, Roxbury; R. M. Merrick, W. Noyes, Dorchester; W. T. Patch, Roxbury; A. P. Perry, Jamaica Plain; L. A. Roberts, Dorchester; E. P. Starbird, G. B. Stevens, Roxbury; S. E. Stevens, West Roxbury; W. N. Tenney, Canton; A. G. Williams, Brookline; A. M. Worthington, Dedham; E. C. Wylie, Dorchester.

Norfolk South. — C. S. Adams, Wollaston; J. H. Libby, East Weymouth; E. N. Mayberry, V. M. Tirrell, South Weymouth.

Plymouth.— H. F. Copeland, Whitman; H. W. Dudley, Abington; N. K. Noyes, Duxbury; A. E. Paine, F. J. Ripley, Brockton; F. G. Wheatley, North Abington.

Suffolk.—J. B. Ayer, E. G. Brackett, E. H. Bradford, E. M. Buckingham, *Treasurer*, H. L. Burrell, J. F. Bush, A. T. Cabot, D. W. Cheever, A. Coolidge, Jr., F. J. Cotton, E. G. Cutler, H. Derby, F. W. Draper, R. H. Fitz, C. F. Folsom, W. W. Gannet, C. M. Green, F. B. Harrington, H. Jackson, B. J. Jeffries, G. F. Jelly, E. P. Joslin, F. I. Knight, A. L. Mason, J. H. McCollom, A. B. Morong, F. G. Morrill, J. G. Mumford, J. C. Munro, A. H. Nichols, C. B. Porter, A. Post, J. J. Putnam, W. L. Richardson, T. M. Rotch, G. H. M. Rowe, F. C. Shattuck, G. B. Shattuck, A. K. Stone, J. B. Swift, H. F. Vickery, O. F. Wadsworth, J. C. Warren, J. C. White, H. Williams, G. Wolcott, Boston; M. F. Gavin, South Boston; J. M. Putnam, Chelsea.

Worcester.—W. P. Bowers, Clinton; P. P. Comey, W. Davis, J. F. Duggan, O. H. Everett, G. A. Francis, *President*, T. H. Gage, Worcester; E. B. Harvey, Westboro'; S. P. Holbrook, East Douglas; J. O. Marble, H. M. Quinby, Worcester; W. G. Reed, Southbridge; E. W. Norwood, E. R. Wheeler, Spencer; E. V. Scribner, L. Wheeler, A. Wood, S. B. Woodward, Worcester.

Worcester North. — C. E. Bigelow, Leominster; J. R. Greenleaf, Gardner; E. S. Greenwood, Templeton; E. P. Miller, C. H. Rice, Fitchburg.

Censors.

Barnstable.—I. O. Cummings, *Supervisor*, Brewster; S. T. Davis, Orleans; G. W. Doane, Hyannis; L. Edmonds, Harwich; R. H. Faunce, Sandwich.

Berkshire.—H. Bushnell, North Adams; H. Colt, W. W. Leavitt, *Supervisor*, W. M. Mercer, Pittsfield; W. W. Scofield, Dalton.

Bristol North.—H. B. Baker, Dighton; F. A. Hubbard, M. Perry, S. D. Presbrey, *Supervisor*, E. Washburn, Taunton.

Bristol South.—S. W. Bowen, A. I. Connell, W. A. Dolan, *Supervisor*, Fall River; E. W. Dehu, A. M. Pierce, New Bedford.

Essex North.— C. C. Day, Newburyport; C. E. Durant, *Supervisor*, Haverhill; W. J. Sullivan, Lawrence; F. E. Sweetsir, Merrimack; L. J. Young, Haverhill.

Essex South.—G. H. Gray, M. A. Harmon, Lynn; J. H. Knowles, *Supervisor*, Gloucester; E. L. Peirson, H. Phippen, Salem.

Franklin.—E. G. Best, Turner's Falls; J. W. Cram, Colrain; G. R. Fessenden, Ashfield; N. P. Wood, *Supervisor*, Northfield; C. G. Trow, Sunderland.

Hampden.—C. A. Allen, Holyoke; R. P. M. Ames, *Supervisor*, E. H. Guild, H. W. VanAllen, Springfield; C. W .Jackson, Monson.

Hampshire.—A. M. Belden, *Supervisor*, Northampton; J. J. Burke, Easthampton; J. G. Hayes, Williamsburg; W. J. Parmelee, Worthington; W. P. Stutson, Cummington.

Middlesex East.—J. P. Bixby, Woburn; D. T. Buzzell, Wilmington; C. W. Harlow, *Supervisor*, F. H. Morse, Melrose; W. H. Keleher, Woburn.

Middlesex North.—C. M. Frye, T. F. Harrington, S. J. Johnson, G. E. Pinkham, C. E. Simpson, *Supervisor*, Lowell.

Middlesex South.—G. W. Bryant, Somerville; O. W. Collins, South Framingham; H. B. McIntire, *Supervisor*, W. Preble, Cambridge; J. Tolman, Arlington.

Norfolk.—C. G. Dewey, Dorchester; G. H. Francis, G. W. Kaan, Brookline; H. R. Hitchcock, Hyde Park; G. B. Stevens, *Supervisor*, Roxbury.

Norfolk South.—H. L. Dearing, Braintree; O. H. Howe, Cohasset; J. A. Gordon, N. S. Hunting, Quincy; E. N. Mayberry, *Supervisor*, South Weymouth.

Plymouth.—J. E. Bacon, W. P. Chisholm, Brockton; C. A. Drew, Bridgewater; G. Osgood, Rockland; F. J. Ripley, *Supervisor*, Brockton.

SUFFOLK.—F. G. Balch, A. Coolidge, Jr., *Supervisor*, H. A. Lothrop, A. K. Stone, G. H. Washburn, Boston.

WORCESTER.—F. H. Baker, M. F. Fallon, H. Gage, E. V. Scribner, *Supervisor*, Worcester; C. L. French, Clinton.

WORCESTER NORTH.—J. G. Henry, Winchenden; A. P. Mason, Fitchburg; C. H. Rice, *Supervisor*, C. W. Spring, Fitchburg; G. B. Underwood, West Gardner.

Commissioners of Trials.

BARNSTABLE	W. D. Kinney	Osterville.
BERKSHIRE	A. T. Wakefield	Sheffield.
BRISTOL NORTH	T. J. Robinson	Taunton.
BRISTOL SOUTH	H. S. Swan	Middleboro'.
ESSEX NORTH	F. A. Howe	Newburyport.
ESSEX SOUTH	J. Allen	Topsfield.
FRANKLIN	J. D. Seymour	Whately.
HAMPDEN	F. W. Chapin	Springfield.
HAMPSHIRE	C. F. Branch	Amherst.
MIDDLESEX EAST	C. C. Odlin	Melrose.
MIDDLESEX NORTH	W. B. Jackson	Lowell.
MIDDLESEX SOUTH	E. R. Cutler	Waltham.
NORFOLK	E. B. Lane	Dorchester.
NORFOLK SOUTH	N. S. Hunting	Quincy.
PLYMOUTH	E. D. Hill	Plymouth.
SUFFOLK	F. W. Draper	Boston.
WORCESTER	C. H. Perry	Worcester.
WORCESTER NORTH	L. G. Chandler	Townsend.

Officers of the District Medical Societies.

BARNSTABLE.—S. F. Haskins, Cotuit, *President;* J. H. Higgins, Marston's Mills, *Vice-President;* C. E. Harris, Hyannis, *Secretary;* C. W. Milliken, Barnstable, *Treasurer.*

BERKSHIRE.—M. M. Brown, North Adams, *President;* J. J. Flynn, Pittsfield, *Vice-President;* L. C. Swift, Pittsfield, *Secretary;* W. L. Paddock, Pittsfield, *Treasurer;* W. W. Leavitt, Pittsfield, *Librarian.*

Bristol North. — W. Y. Fox, Taunton, *President;* T. J. Robinson, Taunton, *Vice-President;* R. D. Dean, Taunton, *Secretary;* W. Y. Fox, Taunton, *Treasurer;* E. Washburn, Taunton, *Librarian.*

Bristol South.—J. C. Pothier, New Bedford, *President;* D. E. Cone, Fall River, *Vice-President;* A. J. Abbe, Fall River, *Secretary and Treasurer.*

Essex North.—J. F. Croston, Haverhill, *President;* H. G. Leslie, Amesbury, *Vice-President;* M. D. Clarke, Haverhill, *Secretary and Treasurer.*

Essex South.—F. S. Atwood, Salem, *President;* S. P. F. Cook, Gloucester, *Vice-President;* H. E. Sears, Beverly, *Secretary;* C. Z. Goodell, Salem, *Treasurer;* G. K. Blair, Salem, *Librarian.*

Franklin.—F. J. Canedy, Shelburne Falls, *President;* C. C. Messer, Turner's Falls, *Vice-President;* H. G. Stetson, Greenfield, *Secretary and Treasurer.*

Hampden.—J. W. Hannum, Ludlow, *President;* A. O. Squier, Springfield, *Vice-President;* J. E. Marsh, Springfield, *Secretary and Treasurer.*

Hampshire.—C. R. Gardner, Northampton, *President;* A. G. Blodgett, Ware, *Vice-President;* A. G. Minshall, Northampton, *Secretary;* A. H. Hoadley, Northampton, *Treasurer;* E. W. Brown, Northampton, *Librarian.*

Middlesex East.—M. A. Cummings, Winchester, *President;* G. N. P. Mead, Winchester, *Vice-President;* H. G. Blake, Woburn, *Secretary;* C. Dutton, Wakefield, *Treasurer.*

Middlesex North.—W. G. Eaton, Lowell, *President;* B. R. Benner, Lowell, *Vice-President;* R. J. Meigs, Lowell, *Secretary;* T. B. Smith, Lowell, *Treasurer;* D. N. Patterson, Lowell, *Librarian.*

Middlesex South.—E. G. Hoitt, Marlboro', *President;* A. Worcester, Waltham, *Vice-President;* A. August, Cambridge, *Secretary;* W. Ela, Cambridge, *Treasurer;* E. S. Dow, Allston, *Librarian.*

Norfolk.—W. Channing, Brookline, *President;* O. F. Rogers, Dorchester, *Vice-President;* J. C. D. Pigeon, Roxbury, *Secretary and Librarian;* E. G. Morse, Roxbury, *Treasurer.*

Norfolk South.—W. A. Drake, North Weymouth, *President;* J. F. Welch, Quincy, *Vice-President;* S. W. Ellsworth, Quincy, *Secretary, Treasurer and Librarian.*

Plymouth.—J. H. Averill, Campello, *President;* W. P. Chisholm, Brockton, *Vice-President;* A. C. Smith, Brockton, *Secretary and Treasurer;* C. E. Lovell, Whitman, *Librarian.*

Suffolk.—A. T. Cabot, Boston, *President;* Abner Post, Boston, *Vice-President;* L. R. G. Crandon, Boston, *Secretary;* W. H. Prescott, Boston, *Treasurer;* B. J. Jeffries, Boston, *Librarian.*

Worcester.—W. P. Bowers, Clinton, *President;* O. H. Everett, Worcester, *Vice-President;* G. E. Emery, Worcester, *Secretary;* G. O. Ward, Worcester, *Treasurer;* A. C. Getchell, Worcester, *Librarian.*

Worcester North.—H. P. Hall, Leominster, *President;* E. A. Sawyer, Gardner, *Vice-President;* W. F. Sawyer, Fitchburg, *Secretary;* E. L. Fiske, Fitchburg, *Treasurer;* A. P. Mason, Fitchburg, *Librarian.*

The Massachusetts Medical Society.

PROCEEDINGS OF THE COUNCILLORS.

October 7, 1903.

A Stated Meeting of the Councillors was held in the Medical Library, Boston, on Wednesday, October 7, 1903, at 12, noon.

The President, Dr. George E. Francis, in the chair.

The following Councillors were present:

Berkshire.
J. F. A. Adams,
O. J. Brown.

Bristol North.
S. D. Presbrey,
T. J. Robinson.

Bristol South.
W. A. Dolan,
J. H. Gifford,
G. deN. Hough,
F. E. Stetson.

Essex North.
J. F. Young.

Essex South.
C. H. Bangs,
P. C. Proctor,
J. Shanahan.

Franklin.
B. P. Croft,
H. G. Stetson.

Hampden.
J. P. Schneider.

Middlesex East.
D. C. Dennett,
E. S. Jack.

Middlesex North.
J. V. Meigs,
C. E. Simpson.

Middlesex South.
D. E. Baker,
R. E. Brown,
J. E. Cleaves,
C. H. Cook,
A. G. Griffin,
J. L. Hildreth,
E. A. Hobbs,
E. D. Hooker,
R. P. Loring,
H. B. McIntire,
H. P. Makechnie,
H. E. Marion,
J. T. G. Nichols,
A. L. Norris,
C. E. Prior,
F. M. Sherman,
E. H. Stevens,
L. R. Stone,
J. W. Willis,
R. Willis.

Norfolk.
F. R. Abbe,
F. P. Denny,
D. Graham,
A. D. Hodges,
W. C. Kite,
C. D. Knowlton,
J. H. S. Leard,
F. D. Lyon,
E. G. Morse,
W. Noyes,
W. T. Patch,
A. P. Perry,
L. A. Roberts,
E. P. Starbird,
S. E. Stevens,

A. G. Williams,
E. C. Wylie.

Norfolk South.
C. S. Adams,
E. N. Mayberry,
V. M. Tirrell.

Plymouth.
H. W. Dudley,
N. K. Noyes,
A. E. Paine.

Suffolk.
J. B. Ayer,
E. G. Brackett,
E. H. Bradford,
E. M. Buckingham,
J. F. Bush,
D. W. Cheever,
A. Coolidge, Jr.,
E. G. Cutler,
C. F. Folsom,
M. F. Gavin,
C. M. Green,
F. I. Knight,
J. H. McCollom,
A. B. Morong,
J. G. Mumford,
J. C. Munro,
J. M. Putnam,
W. L. Richardson,
T. M. Rotch,
F. C. Shattuck,
G. B. Shattuck,
A. K. Stone,
J. B. Swift,
H. F. Vickery,
O. F. Wadsworth.

Worcester.
W. Davis,
G. E. Francis,
J. O. Marble,
E. W. Norwood,
L. Wheeler,
S. B. Woodward.

Worcester North.
C. E. Bigelow,
C. H. Rice.

Total, 95.

The record of the last meeting was read and accepted.

The following were appointed Delegates to other State Medical Societies:

Vermont.—O. S. Roberts, of Pittsfield; E. A. Sawyer, of Gardner.

New York.—R. H. Fitz, G. B. Shattuck, of Boston.

New York State Medical Association.—A. T. Cabot, of Boston; G. deN. Hough, of New Bedford.

The Committee on Membership and Finance reported through Dr. Cutler. In accordance with their recommendation, it was voted that the following be allowed to resign:

John W. Nelson, of Jamestown, N. Y.
Wilbur F. Noyes, of Lamar, Colo.

Also that the following be placed on the retired list:

Rollin C. Ward, of East Orange, N. J.

Also that the following be deprived of the privileges of membership under By-Law VIII. for non-payment of dues:

Ellis H. Cornish, of Carver.
Michael R. Donovan, of Lynn.
Paul F. Ela, of East Douglas.

Harvey A. Field, of Dorchester.
John A. Follett, of Brookline.
Edward M. Harding, of Boston.
Cornelius P. Harkins, of Jamaica Plain.
Edward B. Hodskins, of Springfield.
Louis D. O. Jacques, of Worcester.
Eugene T. McNamara, of Boston.
Edward C. Newton, of Everett.
William D. Nutter, of Malden.
Walter H. Pigeon.
William G. Potter, of New Bedford.
Waldo H. Tyler, of Cambridge.

Voted, That the following be restored to the privileges of membership in the Society:

George Bailey Coon, of East Walpole.
John Augustus Horgan, of Roxbury.
William Ellsworth McPherson, of Charlestown.

Adjourned at 12.40 P.M.

FRANCIS W. GOSS,
Recording Secretary.

FEBRUARY 3, 1904.

A STATED MEETING of the Councillors was held in the Medical Library, Boston, on Wednesday, February 3, 1904, at 12, noon.

The President, Dr. GEORGE E. FRANCIS, in the chair.

The following Councillors were present:

Berkshire.
J. F. A. Adams.

Bristol South.
W. A. Dolan,
J. H. Gifford,
G. deN. Hough.

Essex North.
I. J. Clarke,
J. G. McAllister.

Essex South.
C. H. Bangs,
J. Shanahan,
J. E. Simpson.

Franklin.
B. P. Croft,
H. G. Stetson.

Middlesex North.
J. A. Gage,
J. E. Lamoureux,
W. P. Lawler,
G. H. A. Leahey,
J. V. Meigs.

Middlesex South.
D. E. Baker,
R. E. Brown,
J. E. Cleaves,
C. H. Cook,
J. L. Hildreth,

E. A. Hobbs,
E. G. Hoitt,
E. D. Hooker,
H. P. Makechnie,
H. E. Marion,
A. L. Norris,
G. A. Oviatt,
F. M. Sherman,
L. R. Stone,
H. P. Walcott,
R. Willis,
H. A. Wood.

Norfolk.

F. R. Abbe,
D. Graham,
R. W. Hastings,
A. D. Hodges,
F. D. Lyon,
R. M. Merrick,
W. Noyes,
W. T. Patch,
L. A. Roberts,
A. G. Williams,
E. G. Wylie.

Norfolk South.

C. S. Adams,
E. N. Mayberry,
V. M. Tirrell.

Plymouth.

H. W. Dudley,
N. K. Noyes,
A. E. Paine,
F. G. Wheatley.

Suffolk.

J. B. Ayer,
E. G. Brackett,
E. M. Buckingham,
J. F. Bush,
D. W. Cheever,
A. Coolidge, Jr.,
F. J. Cotton,
F. W. Draper,
R. H. Fitz,
C. F. Folsom,
M. F. Gavin,
F. B. Harrington,
E. P. Joslin,
A. L. Mason,
J. H. McCollom,
A. B. Morong,
J. G. Mumford,
A. H. Nichols,
C. B. Porter,
J. J. Putnam,
W. L. Richardson,
G. H. M. Rowe,
F. C. Shattuck,
H. F. Vickery,
O. F. Wadsworth,
J. C. Warren,
J. C. White,
G. Wolcott.

Worcester.

P. P. Comey,
O. H. Everett,
G. E. Francis,
S. P. Holbrook,
L. Wheeler.

Total, 84.

The record of the last meeting was read and accepted.

The following were appointed Delegates to other Medical Societies:

American Medical Association, 1904 and 1905.—S. D. Presbrey, of Taunton; W. M. Mercer, of Pittsfield; Albert Wood, of Worcester.

Alternates.—G. de N. Hough, of New Bedford; H. G. Stetson, of Greenfield; R. P. M. Ames, of Springfield.

Maine.—H. M. Quinby, of Worcester; J. F. Young, of Newburyport.

New Hampshire.—D. N. Blakely, of Roxbury; R. J. Meigs, of Lowell.

Rhode Island.—Grace Wolcott, of Boston; S. W. Kelley, of Woburn.

Connecticut.—J. W. Hunnum, of Ludlow; A. H. Hoadley, of Northampton.

New Jersey.—E. L. Peirson, of Salem; W. E. Boardman, of Boston.

The following Committee was appointed:

To Audit the Treasurer's Accounts.—R. P. Loring, Alexander Quackenboss.

The Committee on Membership and Finance reported through Dr. Stone. In accordance with their recommendation it was voted that the following be allowed to resign:

Charles E. Ryder, U. S. Navy.

Also, that the following be placed on the retired list:

Henry W. Dudley, of Abington.

The Committee on Medical Diplomas reported through Dr. Marion. In accordance with their recommendation it was voted that the following be added to the list of Medical Colleges whose diplomas are recognized:

Kentucky University, Louisville, Ky.
American Medical Missionary College, Chicago, Ill.

Voted, That Dr. G. G. Sears, of Boston, be appointed to fill the vacancy in the Committee on State and National Legislation caused by the death of Dr. B. H. Hartwell, of Ayer.

Adjourned at 12.25 P.M.

FRANCIS W. GOSS,
Recording Secretary.

JUNE 7, 1904.

THE ANNUAL MEETING of the Councillors was held in the Medical Library, Boston, on Tuesday, June 7, 1904, at 5 P.M.

The President, Dr. GEORGE E. FRANCIS, in the chair.

The following Councillors were present:

Berkshire.	*Bristol North.*	*Essex North.*
J. F. A. Adams,	A. S. Deane.	I. J. Clarke,
O. J. Brown,		J. A. Douglass,
H. Bushnell,	*Bristol South.*	J. G. McAllister,
L. C. Swift.	W. A. Dolan,	W. W. Pillsbury.
	G. deN. Hough.	

Essex South.
C. H. Bangs,
D. Coggin,
H. J. Hall,
H. W. Mitchell,
P. C. Proctor.

Franklin.
N. P. Wood.

Hampden.
F. W. Chapin,
D. E. Keefe,
S. A. Mahoney,
R. V. Sawin.

Hampshire.
A. M. Belden.

Middlesex East.
J. P. Bixby.

Middlesex North.
T. F. Harrington,
J. V. Meigs.

Middlesex South.
D. E. Baker,
E. H. Bigelow,
R. E. Brown,
J. E. Cleaves,
C. H. Cook,
F. G. Curtis,
J. G. Dearborn,
T. M. Durell,
W. Ela,
A. G. Griffin,
N. C. B. Haviland,
E. D. Hooker,
H. B. McIntire,
H. E. Marion,
J. T. G. Nichols,
C. E. Prior,
F. M. Sherman,
E. H. Stevens,
L. R. Stone,
F. W. Taylor,
R. Willis,
H. A. Wood.

Norfolk.
F. R. Abbe,
E. E. Bancroft,
B. H. Calkins,
F. H. Davenport,
F. P. Denny,
G. H. French,
D. Graham,
A. D. Hodges,
W. C. Kite,
C. D. Knowlton,
F. D. Lyon,
E. G. Morse,
W. Noyes,
W. T. Patch,
A. P. Perry,
L. A. Roberts,
E. P. Starbird,
A. G. Williams,
A. M. Worthington,
E. C. Wylie.

Norfolk South.
C. S. Adams,
N. S. Hunting,
E. N. Mayberry,
V. M. Tirrell.

Plymouth.
N. K. Noyes,
G. Osgood,
A. E. Paine,
F. G. Wheatley.

Suffolk.
E. S. Boland,
E. H. Bradford,
E. M. Buckingham,
H. L. Burrell,
J. F. Bush,
D. W. Cheever,
A. Coolidge, Jr.,
H. Derby,
F. W. Draper,
C. F. Folsom,
C. M. Green,
B. J. Jeffries,
E. P. Joslin,
A. L. Mason,
J. H. McCollom,
A. B. Morong,
A. H. Nichols,
C. B. Porter,
A. Post,
J. J. Putnam,
W. L. Richardson,
G. H. M. Rowe,
G. B. Shattnck,
A. K. Stone,
J. B. Swift,
H. F. Vickery,
O. F. Wadsworth,
J. C. Warren,
J. C. White,
H. Williams,
G. Wolcott,

Worcester.
P. P. Comey,
W. Davis,
G. E. Francis,
S. P. Holbrook,
J. O. Marble,
E. W. Norwood,
L. Wheeler,
A. Wood,
S. B. Woodward.

Worcester North.
C. E. Bigelow,
J. R. Greenleaf,
S. E. Greenwood,
E. P. Miller,
C. H. Rice.

Total, 120.

The record of the last meeting was read and accepted.

The Secretary read the names of new and of deceased Fellows.

The Treasurer, Dr. Buckingham, read his annual report.

The Auditing Committee reported that they found the accounts correctly cast and properly vouched, and that the Treasurer has in his possession the securities called for.

Voted, To accept the Treasurer's report.

The Committee on Membership and Finance reported through Dr. Stone, and recommended that $4,500.00 of the surplus in the treasury be distributed among the District Societies.

Voted, That the recommendation be adopted.

In accordance with the recommendation of the same Committee it was voted, that the resignations of the following be accepted:

Irving R. Bancroft, of Telluride, Colo.
Harold C. Goodwin, of Concord, N. H.
Robert Hazen, of Thomaston, Conn.
Walter K. Jewett, of Albany, N. Y.
Andrew F. Reed, of Arlington.
Silas G. Soules, of Hudson.
Philip K. Taylor, of Kingston, R. I.

Also, that the following be placed on the retired list:

Rebecca Barnard, of Worcester.
Henry R. Brissett, of Lowell.
James A. Bushee, of Medford.
George Dresser, of Chicopee.
P. O'Meara Edson, of Roxbury.
C. Ellery Stedman, of Boston.

Also, that the following be deprived of the privileges of membership under By-Law VIII. for non-payment of dues:

Frederick S. Bennett, of Roxbury.

Voted, That the following be restored to the privileges of membership in the Society:

Ransford DeLos Canedy, of North Adams.
Frederick Tigh, of Newburyport.

The Committee on Publications reported through Dr. Wadsworth.

The Librarian, Dr. Brigham, presented his annual report.

The Committee on Nominations reported a list of candidates for the offices of the Society for the ensuing year, and the same were elected by ballot:

President . .	Arthur T. Cabot, of Boston.
Vice-President .	George W. Gay, of Newton.
Treasurer . .	Edward M. Buckingham, of Boston.
Corresponding Sec'y	Charles W. Swan, of Brookline.
Recording Secretary	Francis W. Goss, of Roxbury.
Librarian . .	Edwin H. Brigham, of Brookline.

Charles A. Drew, of Bridgewater, was chosen Orator for the annual meeting of the Society in 1905.

Voted, That the next annual meeting of the Society be held in Boston on the second Wednesday in June, 1905.

The following Standing Committee were appointed:

Of Arrangements.

J. C. Hubbard, G. S. C. Badger,
Farrar Cobb, Lincoln Davis,
A. P. Perry, L. W. Gilbert.

On Publications.

O. F. Wadsworth, G. B. Shattuck, H. L. Burrell.

On Membership and Finance.

L. R. Stone, F. W. Goss, Walter Ela,
C. M. Green, A. Coolidge, Jr.

To Procure Scientific Papers.

C. F. Withington, J. B. Blake, B. P. Croft,
R. C. Larrabee, M. D. Clarke.

On Ethics and Discipline.

C. G. Carleton, Edward Cowles, J. F. A. Adams,
Leonard Wheeler, J. A. Gage.

On Medical Diplomas.

H. E. Marion, O. F. Rogers, H. W. Newhall.

On State and National Legislation.

A. T. Cabot, H. P. Bowditch, S. D. Presbrey,
S. W. Abbott, G. G. Sears.

The resignation of Dr. L. J. Gibbs as Councillor from Hampden District, in order to correct irregularities in the election in that District, was received.

Voted, To accept the resignation.

Voted, That Dr. E. H. Guild be elected to fill the vacancy caused by Dr. Gibbs's resignation, and also that he be chosen Supervising Censor for Hampden District.

On motion of Dr. Warren it was *Voted*, That The Massachusetts Medical Society extend a cordial invitation to the American Medical Association to meet in Boston in 1906.

Adjourned at 6 P.M.

FRANCIS W. GOSS,
Recording Secretary.

The Massachusetts Medical Society.

PROCEEDINGS OF THE SOCIETY.

ANNUAL MEETING.

First Day.

June 7, 1904.

Sectional meetings were held in the Medical Library, Boston, on Tuesday, June 7, 1904, at 2 p.m.

The sections were organized and papers were presented as follows:

SECTION IN MEDICINE.

Dr. J. F. Alleyne Adams, of Pittsfield . . . . Chairman.
Dr. Ralph C. Larrabee, of Boston . . . . . Secretary.

Examination of Pleural Fluids with Reference to their Etiology and Diagnostic Value.—By Dr. Percy Musgrave, of Boston.

Heart Complications in Diphtheria. A Clinical Study of 1200 Cases.—By Drs. F. W. White and H. H. Smith, of Boston.

Experiments upon the Blood Pressure in Febrile Patients following the Administration of Strychnine.—By Dr. R. C. Cabot, of Boston.

Disease of the Myocardium.—By Dr. Henry Jackson, of Boston.

A Case of Malignant Endocarditis.—By Dr. J. F. A. Adams, of Pittsfield.

SECTION IN SURGERY.

Dr. Francis B. Harrington, of Boston . . . . Chairman.
Dr. Ernest A. Codman, of Boston . . . . . Secretary.

The Treatment of Lateral Curvature.—By Dr. E. H. Bradford, of Boston.

Malpositions of the Uterus: Causes and Treatment.—By Dr. D. J. Brown, of Springfield.

Gastric Surgery, with a Report of Cases.—By Dr. J. C. Munro, of Boston.

Report of Two Cases of Very Large Ventral Hernia, Closed by Implantation of Silver Filagree.—By Dr. H. B. Perry, of Northampton.

Obstructive Renal Retention with Anuria, and its Treatment.—By Dr. F. S. Watson, of Boston.

At 8 p.m., the Shattuck Lecture was delivered by Dr. George S. Huntington, of New York City.

Following the lecture a social hour was passed.

Second Day.

June 8, 1904.

The Society met in Mechanic Building, Boston, on Wednesday, June 8, 1904, at 9 a.m., for the exercises of the one hundred and twenty-third Anniversary.

The President, Dr. George E. Francis, in the chair.

The record of the last annual meeting was read and accepted.

The Secretary read the names of Fellows reported admitted since the last annual meeting, and of those whose deaths had been recorded.

Admissions reported since June 9, 1903.

1903	Adams, Eva Argene . . .	Boston.
1904	Adams, Zabdiel Boylston . .	Boston.
1903	Andrews, John Henry . . .	Lynn.

1904	Austin, Mabel Fletcher	Roxbury.
1903	Averell, Charles Wilson	North Reading.
1903	Baker, Osmyn	Northampton.
1904	Ball, Clarence Franklin	Melrose.
1903	Barnes, Allan Foster	Cambridge.
1903	Beal, Howard Walter	Worcester.
1903	Benner, Richard Stanwood	Springfield.
1903	Berry, Nathaniel Leander	Lynn.
1904	Blair, Orrin Curtis	Lynn.
1903	Blodgett, Harold Percival	South Framingham.
1904	Bond, Walter Legrand	West Somerville.
1903	Bowditch, Henry Ingersoll	Boston.
1903	Boyle, John Francis	Lowell.
1903	Brady, James Francis	Boston.
1903	Brayton, Roland Walker	Dorchester.
1903	Burr, Noah Arthur	Springfield.
1904	Cahill, George Stephen	Cambridge.
1903	Calkins, Irving Romaro	Springfield.
1903	Cholerton, Herbert	Somerville.
1903	Clapp, Arthur Martin	Springfield.
1904	Clark, Franklin Edward	Salem.
1904	Clarke, George William	Lowell.
1904	Coburn, Horace Fordyce	Lowell.
1904	Crocker, Louis Allen	Brewster.
1903	Cummings, Michael Aloysius	Fall River.
1903	Cunningham, John Henry, Jr.	Boston.
1904	DeNormandie, Robert Laurent	Boston.
1903	Derby, George Strong	Boston.
1903	Derrick, George William	Rutland.
1904	Donahue, Francis William	Greenfield.
1904	Downing, Charles Harland	Brookline.
1903	Draper, Arthur Derby	Boston.
1904	Drew, Frederick Prescott	East Dedham.
1903	Dwinell, William Grout	Boston.
1904	Dyer, Ernest Arcy	Salem.
1903	Ellis, Robert Hale	Braintree.
1903	Emerson, George Edward	Tewksbury.
1903	Erving, William Gage	Boston.
1904	Evans, Miner Harlow Amos, Jr.	Jamaica Plain.
1904	Eveleth, Charles Wonson	Marblehead.
1903	Feeley, Charles Philip	Cambridge.
1903	Fennessey, John Francis	Boston.
1903	Fernald, Guy Goodwin	Waverley.
1903	Ferris, Phœbe Annie	Boston.
1904	Field, Martin Thomas	Salem.
1903	Fuller, Charles Benjamin	Waltham.
1904	Galvin, Augustus Hughes	Springfield.

1903	Gay, Fritz Walter	Malden.
1903	Generalis, Demosthenes John	Lowell.
1904	Gifford, Nathaniel Howland	Boston.
1903	Gilfillan, Donald Robert	Northampton.
1904	Godfrey, Thomas Francis	Springfield.
1904	Goodall, Harry Winfred	Boston.
1904	Grant, William Victor	Lawrence.
1904	Graves, Robert John	Boston.
1903	Hare, William Andrew	Gilbertville.
1903	Harriman, Perley	Lynn.
1903	Hawes, John Bromham, 2d	Boston.
1903	Hickey, James Eloi	Springfield.
1903	Hickey, John Joseph	Springfield.
1903	Hillard, James Pearse	Springfield.
1904	Hunt, Wilson Eugene	Malden.
1903	Hurley, John Joseph	Newburyport.
1903	Jackman, Alice May	Wakefield.
1903	Johnson, Peer Prescott	Beverly.
1904	Joyce, James Henry	Salem.
1903	Kapp, Julia Seaton	Roxbury.
1904	Katsainos, George Michel	Lowell.
1903	Keaney, Henry Joseph	Everett.
1903	Keisker, Laura	Boston.
1903	Kenealy, Joseph Henry	Northampton.
1904	Kinloch, Raymond Alexander	Springfield.
1903	Knowles, Robert Keneborough Black	Gloucester.
1903	Langworthy, Henry Glover	Dubuque, Iowa.
1903	Lemaire, Willard Wallace	Taunton.
1904	Lilienthal, Alice	Cambridge.
1903	Lindquist, Carl Augustus	Everett.
1904	Lindsey, John Hathaway	Fall River.
1903	Livingston, Clarence Bertram	Lowell.
1903	Locke, Edwin Allen	Boston.
1903	Long, Margaret	New York, N. Y.
1903	Lynch, Cornelius Joseph	Quincy.
1904	McCausland, William James	Quincy.
1904	McCormick, Thomas Joseph Henry	Roxbury.
1903	Mackay, Andrew Joseph	Salem.
1904	Macrae, Annie Campbell	Fall River.
1903	Marcley, Walter John	Rutland.
1903	Markham, Erwin Walter	Lee.
1904	Martin, John Brayton	Lynn.
1903	Mead, Louis Guy	Boston.
1904	Moline, Charles	Sunderland.
1903	Mooring, Scott Webber	Gloucester.
1904	Morton, Arthur Oscar	Monson.
1904	Murphy, Edward Martin	Lowell.

1904	Murphy, Frank Augustine	Taunton.
1903	Myers, Samuel William	Boston.
1903	Norris, Albert Perley	Cambridge.
1904	Osgood, George Edward	West Somerville.
1903	Packard, Frederic Henry	Waverley.
1904	Parker, Ernest Lawrence	Boston.
1904	Pastene, Albert Angelo	Dorchester.
1903	Poirier, Horace	Salem.
1903	Porter, Robert Brastow	Boston.
1904	Pote, Leonard Holden	Somerville.
1903	Quinby, William Carter	Boston.
1904	Raymond, Loring Hay	Boston.
1903	Ripley, William Littlefield	Newton.
1903	Roberts, Albert Joseph	Bridgeport, Conn.
1903	Robinson, Samuel	Boston.
1903	Rodrick, Albert Fowler	South Framingham.
1904	Rose, William Milton	Cambridge.
1904	Ruston, Warren Dunn	Boston.
1903	Sanborn, Frederick Rodney	Lynn.
1904	Shannon, James Herbert	Boston.
1904	Shead, Edward Wadsworth	Cambridge.
1904	Sherburne, Andrew Edward	Dorchester.
1903	Simmons, Hannah Coralynn	Worcester.
1903	Sise, Lincoln Fleetford	Medford.
1903	Smith, Hervey Lewis	Springfield.
1904	Smith, Homer Brandel	Boston.
1904	Southard, Elmer Ernest	Boston.
1903	Spalding, Roger	Boston.
1904	Sproull, John	Haverhill.
1903	Stanton, Joseph	Boston.
1903	Stearns, Robert Thomas	New Bedford.
1904	Stevenson, Willis Mack	Cambridge.
1904	Stone, Murray Chaffee	Fitchburg.
1903	Stowell, Frank Edgar	Worcester.
1904	Street, Charles Edward	Springfield.
1903	Sullivan, Edward Coppinger	Brooklyn, N. Y.
1903	Taylor, Erwin Hartwell	Pittsfield.
1904	Thompson, Frederick Henry, Jr.	Fitchburg.
1904	Thompson, Wellington Andrew	Boston.
1903	Thorndike, Townsend William	Boston.
1904	Urquhart, John Edwin	Ashfield.
1904	Varnum, Leavitt R. J.	Lowell.
1904	Vejux-Tyrode, Maurice Paul Octave	Boston.
1904	Walcott, Henry Joel, Jr.	Springfield.
1904	Walsh, John Edward	Revere.
1904	Ward, Edward Silvanus	No. Attleborough.
1903	Wheatley, Louis Frederick	North Abington.

1903	Whittle, John Augustus . .	Wakefield.
1903	Wiggin, William Irving . .	Lowell.
1904	Wolbach, Simeon Burt . . .	Boston.
1903	Wood, Henry Walton . . .	Taunton.
1904	Worthen, Charles Arthur . .	Lynn.

Total, 149.

List of Deceased Fellows.

Admitted.	Name.	Residence.	Date of Death.	Age.
1868	Blodgett, Charles	Holyoke	June 25, 1903	75
1869	Chase, Henry Melville	Lawrence	June 15, 1903	65
1854	Cornish, Theodore Osgood	South Boston	May 23, 1904	80
1840	Dale, William Johnson	North Andover.	Oct. 7, 1903	88
1897	Dunn, Stephen Joseph	Springfield	June 27, 1903	29
1895	Engelmann, George Julius	Framingham	Nov. 16, 1903	56
1869	Folsom, Norton	Cambridge	Sept. 12, 1903	61
1891	Gallison, Jefferson Cushing	Franklin	Feb. 22, 1904	63
1871	Hale, Josiah Little	Brookline	Dec. 21, 1903	62
1870	Hartwell, Benjamin Hall	Ayer	Jan'y 7, 1904	59
1883	Haven, George	Boston	Sept. 27, 1903	42
1836	Ingalls, William	Roxbury	Dec. 1, 1903	90
1881	Liebmann, Gustav	Boston	Feb. 20, 1904	71
1870	Moulton, Benjamin Francis	Lawrence	May 3, 1904	58
1889	Murphy, Daniel Francis	Woburn	Jan'y 31, 1904	44
1875	Nott, Albert	West Newton	Oct. 10, 1903	56
1871	Oliver, Joseph Pearson	Boston	Sept. 11, 1903	58
1873	Quimby, Samuel Foster	Salem	Dec. 21, 1903	63
1883	Race, Gorton Herbert	Gt. Barrington.	July 22, 1903	50
1878	Read, Robert McLellan	Boston	April 21, 1904	55
1859	Robinson, Jonathan Henry	Southborough	March 11, 1904	73
1872	Wadsworth, Peleg	Malden	April 2, 1904	69
1897	Weeks, William Joshua	Malden	Dec. 23, 1903	29
1846	Wellington, James Lloyd	Swanzey	Dec. 18, 1903	86
1894	Wheeler, Charles Augustus	Leominster	Feb. 11, 1904	67
1883	Wheeler, Edward Reed	Spencer	April 30, 1904	64
1892	White, Charles Warren	Fairhaven	May 15, 1904	44
1875	White, Horace Carr	East Somerville	Nov. 26, 1903	67

Total, 28.

The Treasurer's report was read.

The record of the Board of Trial in the case of George S. Hatch was read.

Voted, That the sentence of the Board of Trial be imposed, and that George S. Hatch, of Boston, be and is expelled from his membership of The Massachusetts Medical Society.

Papers were read as follows:

The Present Status of Hydrotherapy and Other Forms of Physical Therapeutics.—By Dr. J. H. Pratt, of Boston.

The Practical Application of Hydrotherapeutic Measures.—By Dr. C. S. Millet, of Brockton.

Mind Cures from the Standpoint of the General Practitioner.—By Dr. R. T. Edes, of Reading.

A Consideration of Mental Therapeutics as Employed by Special Students of the Subject.—By Dr. J. J. Putnam, of Boston.

The Physical Relationship of Finsen Light, Röntgen Rays and Radio-activity.—By W. C. Sabine, A.M., Assistant Professor of Physics, Harvard University.

Voted, That the thanks of the Society be presented to Professor Sabine for his very instructive paper.

The following delegates from other State Medical Societies were present:

New Hampshire.—Drs. E. B. Atherton, A. E. Brownrigg, F. E. Kittredge.

Rhode Island.—Dr. C. H. Leonard.

At 12 M. the Annual Discourse was delivered by Dr. Harold C. Ernst, of Boston.

Voted, That the thanks of the Society be presented to the Orator for his very suggestive and instructive address.

At 1 P.M. the Annual Dinner was served to more than one thousand Fellows.

FRANCIS W. GOSS,
Recording Secretary.

TREASURER'S REPORT.

The accounts for the year ending April 15, 1904, are as follows :

Receipts.

Balance from previous year			$11,289 31
Assessments at Annual Meeting			825 00
" to Treasurer			660 00
" to District Treasurers—			
Barnstable	$125 00		
Berkshire	325 00		
Bristol North	240 00		
Bristol South	440 00		
Essex North	510 00		
Essex South	635 00		
Franklin	155 00		
Hampden	550 00		
Hampshire	295 00		
Middlesex East	235 00		
Middlesex North	530 00		
Middlesex South	1,445 00		
Norfolk	1,455 00		
Norfolk South	255 00		
Plymouth	295 00		
Suffolk	2,790 00		
Worcester	1,055 00		
Worcester North	310 00		
	$11,645 00		11,645 00
Sale of Dinner Tickets			8 00
Interest on funds subject to check—			
Mount Vernon National Bank		88 11	
Bay State Trust Co.		105 36	
New England Trust Co.		7 81	
		$201 28	201 28
Interest on Savings Bank Deposits—			
Franklin Savings Bank		37 93	
Roxbury Institution for Savings		35 30	
Provident Institution for Savings		35 30	
Suffolk Savings Bank		35 30	
		$143 83	143 83
Interest on Bonds —			
United States		400 00	
Massachusetts		140 00	
		540 00	540 00
Interest on Annuities —			
Massachusetts Gen. Hosp. Life Ins. Co.		450 13	
Massachusetts Gen. Hosp. Life Ins. Co.		366 67	
		$816 80	816 80
			$26,129 22

Expenses.

President—travelling		$24 25
Secretary:—		
Record Book	7 75	
Engrossing	15 10	
Printing, stationery and postage	135 13	
	$157 98	157 98
Librarian:—		
Postage and delivering Communications		171 07
Treasurer:—		
Card catalogue	7 75	
Box at Bay State Trust Co.	10 00	
Clerical work at Annual Meeting	30 00	
Carriage of books and papers	1 50	
Printing and postage	152 41	
	$201 66	201 66
District Treasurers		715 61
Censors		519 00
Supervisors		18 16
Overpaid assessments, less commissions		29 75
Exchange		90
Salaries		1,400 00
Rent		750 00
Annual Meeting:—		
Clerical work	$32 40	
Stenographers	25 00	
Electrician	22 40	
Stereopticon	20 00	
Engraving	38 31	
Printing	58 11	
Badges	6 00	
Signs	8 00	
Band	40 00	
Glee Club	28 92	
Flowers	50 00	
Caterer	2,536 96	
Cooling Appolinaris	5 00	
Cigars	161 50	
Police	6 00	
Horticultural Hall	250 00	
Symphony Hall	412 00	
Incidentals	20 00	
	$3,720 60	3,720 60
Cotting Lunch		98 50
Shattuck Lecture		201 00
Committee On Publications		1,309 79
Committee To Procure Scientific Papers		16 94
Board of Trial		20 75
Norfolk District Medical Society		148 17
Annual Dividend		4,500 00

Permanent Fund :—			
Massachusetts 3½ per cent. bonds of July, 1935	$2,000 00		
Premium	120 00		
Interest	20 22		
	$2,140 22	2,140 22	
		16,144 35	16,144 35
Balance			$9,984 87

This balance is deposited with the Bay State Trust Co., and the New England Trust Co.

Permanent Investments.

The permanent investments of the Society are as follows :

Deposit Roxbury Institution for Savings (Cotting Fund)	$1000 00
Deposit Provident Institution for Savings (Cotting Fund)	1000 00
Deposit Suffolk Savings Bank (Cotting Fund)	1000 00
United States 4 per cent. Bond (Phillips Fund)	10,000 00
Annuity Mass. Hospital Life Ins. Co. (Shattuck Fund)	9,166 87
Annuity Mass. Hospital Life Ins. Co. (Permanent Fund)	11,253 30
Massachusetts 3½ per cent. gold bonds (Permanent Fund)	5,000 00
Deposit Franklin Savings Bank (Permanent Fund)	1,074 48
Total	$39,494 65

EDWARD M. BUCKINGHAM,
Treasurer.

The undersigned, a duly appointed committee, having examined the books of the treasurer, find them correctly cast and properly vouched, and also that he has in his possession the securities called for.

ROBERT P. LORING,
ALEX. QUACKENBOSS.

BOSTON, MAY 25, 1904.

Officers of the Massachusetts Medical Society.

1904—1905.

Chosen June 7, 1904.

Arthur T. Cabot,	Boston,	President.
George W. Gay,	Newton,	Vice-President.
Edward M. Buckingham,	Boston,	Treasurer.
Charles W. Swan,	Brookline,	Cor. Secretary.
Francis W. Goss,	Roxbury,	Rec. Secretary.
Edwin H. Brigham,	Brookline,	Librarian.

Standing Committees.

Of Arrangements.

J. C. Hubbard, G. S. C. Badger,
Farrar Cobb, Lincoln Davis,
A. P. Perry, L. W. Gilbert.

On Publications.

O. F. Wadsworth, G. B. Shattuck, H. L. Burrell.

On Membership and Finance.

L. R. Stone, F. W. Goss, Walter Ela,
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Leonard Wheeler, J. A. Gage.

On Medical Diplomas.

H. E. Marion, O. F. Rogers, H. W. Newhall.

On State and National Legislation.

A. T. Cabot, H. P. Bowditch, S. D. Presbrey,
S. W. Abbott, G. G. Sears.

Presidents of District Societies—Vice-Presidents (Ex-Officiis).

[Arranged according to seniority.]

H. G. Leslie,	D. E. Cone,
A. G. Blodgett,	W. A. Drake,
F. J. Canedy,	E. A. Sawyer,
G. W. Clement,	Alfred Worcester,
B. R. Benner,	W. Y. Fox,
A. T. Cabot,	E. L. Peirson,
A. O. Squier,	L. A. Jones,
O. H. Everett,	G. N. P. Mead,
W. P. Chisholm,	J. H. Higgins.

Councillors.

Barnstable.—G. W. Doane, Hyannis; H. B. Hart, East Dennis.

Berkshire.—J. F. A. Adams, Pittsfield; O. J. Brown, H. Bushnell, North Adams; W. W. Leavitt, L. C. Swift, Pittsfield; A. T. Wakefield, Sheffield.

Bristol North.—C. S. Holden, Attleboro'; A. S. Deane, S. D. Presbrey, T. J. Robinson, Taunton.

Bristol South.—A. W. Buck, W. A. Dolan, J. H. Gifford, H. G. Wilbur, Fall River; C. F. Connor, G. deN. Hough, F. E. Stetson, A. P. Webber, New Bedford.

Essex North.—G. M. Atwood, Bradford; C. E. Birtwell, Lawrence; J. A. Douglas, Amesbury; I. J. Clarke, C. E. Durant, Haverhill; J. G. McAllister, Lawrence; W. W. Pillsbury, Newburyport; R. B. Root, Georgetown; L. J. Young, Haverhill.

Essex South.—F. S. Atwood, Salem; F. W. Baldwin, Danvers; C. H. Bangs, Lynn; D. Coggin, Salem; C. W. Haddock, Beverly; H. J. Hall, Marblehead; M. A. Harmon, Lynn; J. H. Knowles, Gloucester; H. W. Mitchell, Hathorne; J. F. O'Shea, Lynn; P. C. Proctor, Gloucester; J. E. Simpson, Salem; S. C. Tucker, Peabody.

Franklin.—B. P. Croft, G. P. Twitchell, Greenfield; N. P. Wood, Northfield.

Hampden.—E. A. Bates, F. W. Chapin, E. H. Guild, Springfield; G. Dresser, Chicopee; J. C. Hubbard, Holyoke; C. W. Jackson, Monson; D. E. Keefe, Springfield; S. A. Mahoney, Holyoke; R. V. Sawin, Brimfield; S. F. Smith, Indian Orchard; H. W. Van Allen, G. D. Weston, Springfield.

Hampshire.—A. M. Belden, Northampton; R. E. Dickson, Granby; W. J. Parmelee, Worthington; C. Seymour, Northampton; W. P. Stutson, Cummington.

Middlesex East.—J. P. Bixby, Woburn; M. A. Cummings, D. C. Dennett, P. Hammond, Winchester; E. S. Jack, Melrose.

Middlesex North.—W. G. Eaton, C. M. Frye, T. F. Harrington, J. E. Lamoureux, W. P. Lawler, G. H. A. Leahey, J. V. Meigs, J. B. O'Connor, O. P. Porter, C. E. Simpson, Lowell.

Middlesex South.—E. D. Baker, Newtonville; W. A. Bell, Somerville; E. H. Bigelow, Framingham; R. A. Blood, Charlestown; R. E. Brown, Everett; T. Chamberlin, Concord; J. E. Cleaves, Medford; C. H. Cook, Natick; F. G. Curtis, Chestnut Hill; J. G. Dearborn, Charlestown; T. M. Durell, Somerville; A. G. Griffin, Malden; W. Ela, J. L. Hildreth, Cambridge; J. L. Harriman, Hudson; N. C. B. Haviland, Holliston; E. G. Hoitt, Marlboro'; E. D. Hooker, Arlington; H. B. McIntire, Cambridge; H. E. Marion, Brighton; J. T. G. Nichols, Cambridge; C. E. Prior, Malden; C. D. Sawin, Charlestown; F. M. Sherman, L. R. Stone, Newton; E. H. Stevens, F. W. Taylor, H. P. Walcott, Cambridge; G. T. Tuttle, Waverley; R. Willis, Somerville; H. A. Wood, A. Worcester, Waltham.

Norfolk.—F. R. Abbe, Dorchester; E. E. Bancroft, Wellesley, B. H. Calkins, Jamaica Plain; F. H. Davenport, F. P. Denny, Brookline; C. G. Dewey, Dorchester; G. H. French, A. D. Hodges, C. D. Knowlton, Roxbury; D. Graham, R. W. Hastings, Brookline; W. C. Kite, Milton; J. S. H. Leard, Jamaica Plain; E. N. Libby, F. D. Lyon, E. G. Morse, Roxbury; H. T. Mansfield, Needham; R. M. Merrick, W. Noyes, Dorchester; W. T. Patch, Roxbury; A. P. Perry, Jamaica Plain; L. A. Roberts, Dorchester; E. P. Starbird, Roxbury; S. E. Stevens, West Roxbury; W. N. Tenney, Canton; A. G. Williams, Brookline; A. M. Worthington, Dedham; E. C. Wylie, Dorchester.

Norfolk South.—C. S. Adams, Wollaston; N. S. Hunting, Quincy; E. N. Mayberry, V. M. Tirrell, South Weymouth.

Plymouth.—H. W. Dudley, Abington; N. K. Noyes, Duxbury; G. Osgood, Rockland; A. E. Paine, Brockton; F. G. Wheatley, North Abington.

Suffolk.—J. B. Ayer, F. G. Balch, E. G. Brackett, E. H. Bradford, E. M. Buckingham, *Treasurer*, H. L. Burrell, J. F. Bush, A. T. Cabot, *President*, D. W. Cheever, A. Coolidge, Jr., J. N. Coolidge, F. J. Cotton, E. G. Cutler, H. Derby, F. W. Draper, R. H. Fitz, C. F. Folsom, W. W. Gannett, C. M. Green, F. B. Harrington, H. Jackson, B. J. Jeffries, G. F. Jelly, E. P. Joslin, F. I. Knight, H. A. Lothrop, A. L. Mason, J. H. McCollom, A. B. Morong, J. G. Mumford, J. C. Munro, A. H. Nichols, C. B. Porter, A. Post, J. J. Putnam, W. L. Richardson, T. M. Rotch, G. H. M. Rowe, F. C. Shattuck, G. B. Shattuck, A. K. Stone, J. B. Swift, H. F. Vickery, O. F. Wadsworth, J. C. Warren, G. H. Washburn, J. C. White, H. Williams, G. Wolcott, Boston; E. S. Boland, M. F. Gavin, South Boston; J. M. Putnam, Chelsea.

Worcester.—W. P. Bowers, Clinton; P. P. Comey, W. Davis, J. T. Duggan, O. H. Everett, G. E. Francis, T. H. Gage, A. C. Getchell, Worcester; E. B. Harvey, Westboro'; S. P. Holbrook, East Douglas; J. O. Marble, H. M. Quinby, Worcester; E. W. Norwood, Spencer; W. G. Reed, Southbridge; E. V. Scribner, L. Wheeler, A. Wood, S. B. Woodward, Worcester.

Worcester North.—C. E. Bigelow, Leominster; J. R. Greenleaf, Gardner; S. E. Greenwood, Templeton; E. P. Miller, C. H. Rice, Fitchburg.

Censors.

Barnstable.—S. T. Davis, Orleans; G. W. Doane, *Supervisor*, Hyannis; L. Edmonds, Harwich; R. H. Faunce, Sandwich; S. Pitcher, Hyannis.

Berkshire.—H. Bushnell, North Adams; H. Colt, W. W. Leavitt, *Supervisor*, W. M. Mercer, Pittsfield; W. W. Scofield, Dalton.

Bristol North.—H. B. Baker, Dighton; F. A. Hubbard, M. Perry, S. D. Presbrey, *Supervisor*, E. Washburn, Taunton.

Bristol South.—S. W. Bowen, A. I. Connell, W. A. Dolan, *Supervisor*, Fall River; E. W. Dehu, A. M. Pierce, New Bedford.

Essex North.—C. C. Day, Newburyport; C. E. Durant, *Superisor*, Haverhill; J. A. FitzHugh, Amesbury; F. E. Sweetsir, Merrimac; L. J. Young, Haverhill.

Essex South.—F. W. Baldwin, Danvers; G. H. Gray, M. A. Harmon, Lynn; J. H. Knowles, *Supervisor*, Gloucester; H. Phippen, Salem.

Franklin.—E. G. Best, Turner's Falls; J. W. Cram, Colrain; G. R. Fessenden, Ashfield; C. G. Trow, Sunderland; N. P. Wood, *Supervisor*, Northfield.

Hampden.—R. P. M. Ames, E. H. Guild, *Supervisor*, R. H. Seelye, Springfield; D. F. Donoghue, E. H. Tierney, Holyoke.

Hampshire.—A. M. Belden, *Supervisor*, S. A. Clark, Northampton; A. C. Cobb, Southampton; J. G. Hayes, Williamsburg; H. B. Perry, Northampton.

Middlesex East.—H. G. Blake, Woburn; M. A. Cummings, *Supervisor*, Winchester; A. H. Cowdrey, G. W. Nickerson, F. E. Park, Stoneham.

Middlesex North.—R. E. Bell, S. J. Johnson, T. G. McGannon, G. E. Pinkham, C. E. Simpson, *Supervisor*, Lowell.

Middlesex South.—G. W. Bryant, Somerville; O. W. Collins, South Framingham; F. G. Curtis, *Supervisor*, Chestnut Hill; W. Preble, Cambridge; J. Tolman, Arlington.

Norfolk.—C. G. Dewey, *Supervisor*, Dorchester; F. P. Emerson, Roxbury; G. H. Francis, G. W. Kaan, Brookline; H. R. Hitchcock, Hyde Park.

Norfolk South.—H. L. Dearing, Braintree; O. H. Howe, Cohasset; J. A. Gordon, N. S. Hunting, Quincy; E. N. Mayberry, *Supervisor*, South Weymouth.

Plymouth.—J. E. Bacon, Brockton; N. C. King, Campello; A. A. MacKeen, Whitman; G. Osgood, *Supervisor*, Rockland; F. J. Ripley, Brockton.

SUFFOLK.—F. G. Balch, J. N. Coolidge, H. A. Lothrop, A. K. Stone, *Supervisor*, G. H. Washburn, Boston.

WORCESTER.—F. H. Baker, M. F. Fallon, H. Gage, E. V. Scribner, *Supervisor*, Worcester; C. L. French, Clinton.

WORCESTER NORTH.—J. G. Henry, Winchendon; E. P. Miller, *Supervisor*, C. W. Spring, Fitchburg; A. E. Mossman, Westminster; G. B. Underwood, West Gardner.

Commissioners of Trials.

BARNSTABLE	S. F. Haskins	Cotuit.
BERKSHIRE	A. T. Wakefield	Sheffield.
BRISTOL NORTH	T. J. Robinson	Taunton.
BRISTOL SOUTH	H. S. Swan	Middleboro'.
ESSEX NORTH	J. F. Young	Newburyport.
ESSEX SOUTH	J. Allen	Topsfield.
FRANKLIN	J. D. Seymour	Whately.
HAMPDEN	L. M. Berry	Chicopee Falls.
HAMPSHIRE	J. M. Fay	Northampton.
MIDDLESEX EAST	C. C. Odlin	Melrose.
MIDDLESEX NORTH	G. A. Harlow	Tyngsboro'.
MIDDLESEX SOUTH	E. R. Cutler	Waltham.
NORFOLK	F. P. Denny	Brookline.
NORFOLK SOUTH	N. S. Hunting	Quincy.
PLYMOUTH	C. A. Drew	State Farm.
SUFFOLK	F. W. Draper	Boston.
WORCESTER	C. H. Perry	Worcester.
WORCESTER NORTH	L. G. Chandler	Townsend.

Officers of the District Medical Societies.

BARNSTABLE.—J. H. Higgins, Marston's Mills, *President;* I. O. Cummings, Brewster, *Vice-President;* C. E. Harris, Hyannis, *Secretary;* C. W. Milliken, Barnstable, *Treasurer.*

BERKSHIRE.—L. A. Jones, North Adams, *President;* A. B. Withington, Pittsfield, *Vice-President;* L. C. Swift, Pittsfield, *Secretary;* W. L. Paddock, Pittsfield, *Treasurer;* W. W. Leavitt, Pittsfield, *Librarian.*

Bristol North.—W. Y. Fox, Taunton, *President;* T. J. Robinson, Taunton, *Vice-President;* R. D. Dean, Taunton, *Secretary;* W. Y. Fox, Taunton, *Treasurer;* E. Washburn, Taunton, *Librarian.*

Bristol South.—D. E. Cone, Fall River, *President;* C. A. Pratt, New Bedford, *Vice-President;* A. J. Abbe, Fall River, *Secretary and Treasurer.*

Essex North.—H. G. Leslie, Amesbury, *President;* W. J. Sullivan, Lawrence, *Vice-President;* M. D. Clarke, Haverhill, *Secretary and Treasurer.*

Essex South.—E. L. Peirson, Salem, *President;* G. E. MacArthur, Ipswich, *Vice-President;* H. E. Sears, Beverly, *Secretary;* G. Z. Goodell, Salem, *Treasurer;* G. K. Blair, Salem, *Librarian.*

Franklin.—F. J. Canedy, Shelburne Falls, *President;* C. C. Messer, Turner's Falls, *Vice-President;* H. G. Stetson, Greenfield, *Secretary and Treasurer.*

Hampden.—A. O. Squier, Springfield, *President;* W. M. E. Mellen, Chicopee, *Vice-President;* J. E. Marsh, Springfield, *Secretary and Treasurer.*

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Middlesex East.—G. N. P. Mead, Winchester, *President;* S. H. Parks, Reading, *Vice-President;* C. W. Harlow, Melrose Highlands, *Secretary;* C. Dutton, Wakefield, *Treasurer.*

Middlesex North.—B. R. Benner, Lowell, *President;* A. Howard, Chelmsford, *Vice-President;* R. J. Meigs, Lowell, *Secretary;* T. B. Smith, Lowell, *Treasurer;* D. N. Patterson, Lowell, *Librarian.*

Middlesex South.—A. Worcester, Waltham, *President;* T. M. Durell, Somerville, *Vice-President;* A. August, Cambridge, *Secretary;* W. Ela, Cambridge, *Treasurer;* E. S. Dow, Allston, *Librarian.*

Norfolk.—G. W. Clement, Roxbury, *President;* J. A. Tanner, Dorchester, *Vice-President;* J. C. D. Pigeon, Roxbury, *Secretary and Librarian;* E. G. Morse, Roxbury, *Treasurer.*

NORFOLK SOUTH.—W. A. Drake, North Weymouth, *President;* J. F. Welch, Quincy, *Vice-President;* S. W. Ellsworth, Quincy, *Secretary, Treasurer and Librarian.*

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WORCESTER.—O. H. Everett, Worcester, *President;* E. W. Norwood, Worcester, *Vice-President;* G. E. Emery, Worcester, *Secretary;* G. O. Ward, Worcester, *Treasurer;* A. C. Getchell, Worcester, *Librarian.*

WORCESTER NORTH.—E. A. Sawyer, Gardner, *President;* G. B. Underwood, West Gardner, *Vice-President;* W. F. Sawyer, Fitchburg, *Secretary;* E. L. Fiske, Fitchburg, *Treasurer;* A. P. Mason, Fitchburg, *Librarian.*

SUPPLEMENT No. I. TO CATALOGUE OF 1902.

Admissions reported since January 1, 1902.

1902	Allison, Nathaniel	Boston.
1902	Bennett, William Hurlburt	Winchendon.
1902	Bragg, Leslie Raymond	Webster.
1902	Brown, Henry Rienzi	Leominster.
1902	Brown, Percy Emerson	Boston.
1902	Brush, Frederic Louis	Boston.
1902	Bryant, John Edmund	Haverhill.
1902	Burley, Benjamin Thomas	Worcester.
1902	Canedy, Charles Francis	Greenfield.
1902	Cary, Foster Harrington	Boston.
1902	Cheever, David	Boston.
1902	Christian, Henry Asbury	Boston.
1902	Chrystal, Michael Henry	Ayer.
1902	Clarke, Louis Henry	Holyoke.
1902	Conner, Homer Leigh	Haverhill.
1902	Cutler, Arthur Hardy	Lawrence.
1902	Dame, Fred Russell	Medford.
1902	Dutton, Richard	Wakefield.
1902	Flagg, Elisha	Boston.
1902	Flynn, John Joseph	Worcester.
1902	French, Warren Kilburn	Worcester.
1902	Glidden, Howard Kenneth	Lynn.
1902	Hall, Walter Davis	Medford.
1902	Hartwell, Harry Fairbanks	Boston.
1902	Hess, Peter William	Boston.
1902	Hewett, William Oakes	Attleborough.
1902	Holmes, Edward Fowler	Tewksbury.
1902	Houle, Anselme Ephrem	Turner's Falls.
1902	Hunt, George Eddy	Holyoke.
1902	Hunt, George Pratt	Pittsfield.
1902	Jones, Harold Wellington	Boston.
1902	Knight, Charles Sumner	Westborough.
1902	Leonard, William Joseph	Springfield.

1902	Lewis, Dwight Milton	Boston.
1902	Lithgow, Robert Alexander Douglas	Beverly.
1902	McDonald, Samuel James	Brighton.
1902	Maguire, Thomas Henry	Dorchester.
1902	Mahony, Francis Ronan	Lowell.
1902	Manix, Edward Tuck	Lynn.
1902	Marvell, Mary Wilbur	Fall River.
1902	Miller, Harry William	Taunton.
1902	Moll, Louis Arthur	Cambridge.
1902	Moulton, Arthur Bertram	Northampton.
1902	Moxom, Philip Wilfred Travis	Newton Highlands.
1902	Murray, Edward Francis	Worcester.
1902	Nay, Winfield Scott	Underhill, Vt.
1902	Newhall, Alden Russell	Lynn.
1902	Nickerson, John Peter	West Harwich.
1902	Nicol, Philippe Henri	Worcester.
1902	Nolen, Walter Freeman	Brookline.
1902	O'Brien, Walter John Leo	South Boston.
1902	Osborne, Caroline Amelia	Worcester.
1902	Parker, Harry Caldwell	Boston.
1902	Patten, Stephen Kerr	Roxbury.
1902	Pearson, Charles Lusby	Boston.
1902	Putnam, Ralph	Tewksbury.
1902	Reed, Caroline Thyng	Leominster.
1902	Sanborn, George Phippen	Brookline.
1902	Seelye, Walter Clark	Worcester.
1902	Shea, Peter Owen	Worcester.
1902	Stack, Charles Francis	Hyde Park.
1902	Stearns, John Warren	Winchester.
1902	Tobey, Edward Nelson	West Somerville.
1902	Trudeau, Marc Aurele	Lowell.
1902	Wadsworth, Richard Goodwin	Boston.
1902	White, Clifford Allen	Northampton.
1902	Williams, Edward Denison	Easthampton.

List of Deceased Fellows.

Admitted.	Name.	Residence.	Date of Death.	Age.
1855	Adams, Zabdiel Boylston	Framingham	May 1, 1902	72
1886	Andrews, William Henry	Springfield	May 19, 1902	47
1898	Fernald, Alberto Francis	Shirley	Feb. 17, 1902	33
1859	Goodell, Jonathan Woodward	Lynn	March 12, 1902	71
1864	Greene, Nathaniel	Jamaica Plain	Feb. 27, 1902	71
1884	Homans, John, 2d	Boston	May 4, 1902	45
1848	King, George	Franklin	April 24, 1902	79
1897	Merchant, Harry Alvin	Monson	June 25, 1901	34
1844	Russell, Henry	Sandwich	April 6, 1898	84

The following has been restored to the privileges of membership:

Henry Delano Kennard, of Peabody.

The following have been placed on the retired list:

Asahel S. Deane, of Taunton.
Jerome Dwelly, of Fall River.
Samuel W. Fletcher, of Pepperell.
Tappan E. Francis, of Brookline.
Daniel W. Wight, of West Medford.

The following resignations have been accepted:

Benjamin Benoit, of Lowell.
Charles V. Buttler, of Mystic, Conn.
Albert S. Dolloff, of New Hampton, N. H.
Adolf Meyer, of New York, N. Y.
Fitz A. Oakes, of Providence, R. I.
Herbert E. Smyth, of Bridgeport, Conn.

The following, having neglected or declined to pay their assessment dues for the past three years, have been deprived of the privileges of membership, in accordance with By-Law VIII.:

Charles H. Barney, U. S. Army.
James A. Coyne, of Clinton.
Charles F. Haynes, of Brighton.
Charles E. Lockwood, of Hallstead, Pa.
Edward W. Pinkham, U. S. Army.

SUPPLEMENT No. II. TO CATALOGUE OF 1902.

Admissions reported since June 10, 1902.

1903	Abbot, Florence Hale	Taunton.
1903	Adams, John Dresser	Boston.
1903	Alexander, Thomas Branch	Scituate.
1903	Allen, Granville Stevens	Lawrence.
1903	Allen, William Howard	Mansfield.
1903	Baff, Max	Worcester.
1903	Baker, George Lorimer	Tewksbury.
1903	Baketel, Roy Vincent	Taunton.
1903	Bancroft, Irving Reed	Allston.
1902	Bartlett, Philip Challis	Worcester.
1903	Bartley, John Joseph	Lawrence.
1902	Belding, John Eastman	Roxbury.
1903	Bergin, Stephen Albert	Worcester.
1903	Binney, Horace	Boston.
1902	Blanchard, Randall Howard	Pittsfield.
1903	Bonnar, James Miller	New Bedford.
1903	Bonney, Robert	East Boston.
1902	Borden, Charles Richardson Cobb	Boston.
1902	Brace, George Welles	Westfield.
1902	Brennan, Joseph Thomas Louis	Lowell.
1903	Brigham, Clarence Sumner	Leominster.
1902	Bruce, Frank Colverd	Easthampton.
1903	Bufford, John Henry	Dorchester.
1902	Bulkeley, Frank Stedman	Ayer.
1903	Butler, Richard Bernard	Fall River.
1903	Caisse, George Emile	Lowell.
1902	Carroll, Thomas Francis	Boston.
1903	Caulfield, Thomas Edward	Woburn.
1902	Chase, Henry Melville, Jr.	Boston.
1902	Chase, Walter Greenough	Brookline.
1903	Cheever, John Howard	Pawtucket, R. I.
1903	Clark, Thomas Francis	Taunton.
1903	Clarke, Elliott Mason	Mansfield.

1902	Clement, Merton Wallace	Worcester.
1902	Cohan, Francis Henry	Leominster.
1903	Collins, Richard	Waltham.
1902	Conro, Arthur Clifton	East Longmeadow.
1903	Cotton, Harry Andrews	Hathorne.
1903	Crofts, Nicholas Matthew	North Adams.
1903	Crosby, Leander Marshall	Wakefield.
1902	Dadmun, Eliza Josephine	Boston.
1903	Dennen, Joseph Horace	Watertown.
1903	Devlin, Peter Clarke	Lynn.
1903	Donaldson, James Frank	Salem.
1902	Dreyfus, Edna Weil	Boston.
1903	Dunn, Charles Hunter	Boston.
1903	Elliott, Alfred	State Farm.
1903	Emerson, Benjamin Kendall, Jr.	Worcester.
1903	Evans, Albert	Boston.
1902	Fish, Ralph Charles	Worcester.
1903	Fisher, Charles Thompson	Worcester.
1902	Fisher, Irving Jewell	West Newton.
1903	Fitzpatrick, John Joseph	Charlestown.
1903	Fleming, Peter Joseph	Lawrence.
1902	Fletcher, Robert Swan	Oxford.
1902	Franz, Adolph	So. Hadley Falls.
1903	Gardner, Archibald Robert	Lowell.
1902	Gardner, Charles Wesley	Boston.
1903	Gay, Herbert Seymour	Boston.
1902	Généreux, Joseph Olivier	Webster.
1902	Gibson, Robert Francis	Boston.
1903	Gleason, George Hathaway	Allston.
1902	Goodridge, Frederick James	Cambridge.
1903	Gould, Alfred Henry	Boston.
1903	Granger, Frank Butler	Randolph.
1903	Gray, Hugh Barr	Chesterfield.
1902	Griffin, Nathan Leroy	Haverhill.
1903	Griffin, Walter Alden	Sharon.
1903	Guild, Alfred Henry	Boston.
1903	Hall, John Baptiste, Jr.	Boston.
1903	Harriman, Cora Elizabeth	Boston.
1902	Harriman, David Eugene	So. Hadley Falls.
1903	Harrington, Michael William	Indian Orchard.
1902	Haskell, Harris Bigelow	Amherst.
1903	Hayes, Wentworth Larrabee	Cambridge.
1903	Haynes, Mabel Stevens	Boston.
1902	Henderson, George Dallas	Holyoke.
1903	Hodgdon, Ralph Franklin	Somerville.
1903	Hodges, Fletcher	Indianapolis, Ind.
1902	Hodskins, Morgan Brewster	Palmer.

1902	Holbrook, Bradbury	West Newton.
1903	Holmberg, Carl Lester Magnus	Campello.
1902	Huckins, Theron Howard	Leominster.
1903	Hunt, Ernest Leroi	Worcester.
1903	Hurwitz, Abraham Joseph	Boston.
1903	Jackson, Howard Bigelow	Concord.
1902	Johnstone, William Joseph	Roxbury.
1903	Jones, Raymond Child	Fitchburg.
1903	Keene, Charles Herbert	Lowell.
1903	Kelley, Daniel Joseph	Worcester.
1903	Kelley, Joseph Henry Hart	Boston.
1902	Knickerbocker, Percy Gates	Allston.
1902	Knight, Charles Lewis	Boston.
1903	Knowlton, Wallace Miles	Brookline.
1903	Konikow, Antonia Buchholz	Boston.
1903	Koplowitz, Abraham	Boston.
1902	Lally, Francis Henry	Worcester.
1902	Levis, Harold James	Fitchburg.
1903	Libby, Mildred Augusta	Baldwinville.
1903	Lilly, Thomas Eugene	Shirley.
1903	Lincoln, Merrick	Worcester.
1903	Loewe, Leonard Joseph	Whitman.
1903	Lootz, Emma	Boston.
1902	Lord, Frederick Taylor	Boston.
1903	Lowd, Harry Mosher	Taunton.
1902	Lowney, John Francis	Fall River.
1902	Lynch, Patrick Michael	Springfield.
1902	McBain, William Hearst	Malden.
1903	McDonald, James William	Worcester.
1903	McGauran, George Daniel	Lawrence.
1903	McHugh, John Francis	Springfield.
1903	McNamara, John James	Brockton.
1903	McPherson, Ross	South Boston.
1903	Magurn, Francis	Charlestown.
1903	Malone, Charles	Jamaica Plain.
1903	Marshall, Augustus Thompson	Dorchester.
1902	Mason, Nathaniel Robert	Boston.
1902	Mayhew, Orlando Smith	Cottage City.
1903	Morgner, Richard August	Lynn.
1903	Murphy, Daniel David	Amesbury.
1902	Murphy, Fred Towsley	Boston.
1903	Myers, Solomon	East Boston.
1903	Nelligan, John Patrick	Cambridge.
1903	Norton, George Edward	Cambridge.
1903	Nye, Harry Royal	Leominster.
1903	O'Brien, Charles Thomas	Worcester.
1903	O'Brien, John Francis	Charlestown.

1902	O'Connor, Dennis Francis	Worcester.
1903	O'Day, George Frederick	Worcester.
1903	O'Donnell, Edmund Emmett	Brockton.
1903	O'Hearn, Daniel Aloysius	Lowell.
1903	Osborne, Ernest Sumner	West Dennis.
1902	O'Toole, Michael James	Worcester.
1902	Parker, Helen Schlesinger	Chestnut Hill.
1903	Penny, Herbert Thomas	Cliftondale.
1902	Pond, Bernard Wesley	Boston.
1903	Pritchard, William Percival	Fall River.
1902	Raynes, Myrton Berry	Melrose Highlands.
1902	Rees, Rees Byron	Boston.
1903	Rice, Robert Astley	Fitchburg.
1903	Rich, Charles Edwin	Lynn.
1903	Richardson, Charles Harper	Pittsfield.
1902	Robbins, Michael Uriah	Newton.
1902	Robertson, Frederick McNaughton	East Milton.
1902	Robinson, Harry Pringle	Tewksbury.
1902	Rollins, Edwin Theodore	Tewksbury.
1902	Rose, William Henry	Worcester.
1903	Scannell, David Daniel	Boston.
1902	Schallenbach, Ernest Bradford	Boston.
1903	Sims, Frederick Robertson	Taunton.
1902	Smith, Forster Hanson	Lowell.
1902	Smith, Theobald	Forest Hills.
1902	Smyser, Charles James	Harwich.
1903	Snow, Frank Whipple	Boston.
1903	Stick, Henry Louis	Worcester.
1902	Stratton, Ralph Ricker	New Bedford.
1903	Sullivan, Florence Augustine	Haverhill.
1902	Tabor, Edward Orlando	Lowell.
1903	Tallant, Alice Weld	Boston.
1903	Thompson, Charles Edward	Tewksbury.
1902	Tileston, Wilder	Boston.
1903	Treston, Maurice Joseph	Pittsfield.
1903	Truesdale, Philemon Edwards	Fall River.
1902	Verhoff, Frederick Herman	Boston.
1902	Walker, David Harold	Boston.
1903	Westall, John	Fall River.
1902	Willard, Frederick Buell	Pittsfield.
1903	Wilson, Louis Thornton	Boston.
1903	Winslow, Frederick Bradlee	Boston.
1902	Woodruff, Richard Allen	Pittsfield.
1902	Woodworth, John Dawson Roswell	Jamaica Plain.
1902	Worth, Edward Philip	Edgartown.
1903	Wynne, Richard	South Boston.
1903	Yeaton, George William	Brookline.

List of Deceased Fellows.

Admitted.	Name.	Residence.	Date of Death.	Age.
1877	Abbott, John Hammill	Fall River	Nov. 1, 1902	55
1862	Allen, William George	Mansfield	April 5, 1903	69
1859	Ames, Joseph Stanford	Holden	March 25, 1903	74
1880	Baker, Lucius Willard	Baldwinsville	Dec. 7, 1902	50
1894	Ball, Charles Dickens Evans	Boston	Mar. 29, 1903	44
1885	Bell, Robert	Roxbury	July 4, 1902	57
1877	Bowen, Charles Wesley	Westfield	Oct. 10, 1902	58
1895	Boynton, Edwin Dana	Harrington, Me.	April 26, 1902	29
1858	Brewster, John Milton	Pittsfield	Oct. 15, 1902	84
1886	Brigham, Frank Fontelle	Lynn	Mar. 10, 1903	43
1867	Bubier, Joseph Augustus	Brookline	Nov. 24, 1902	63
1897	Burke, Ernest Gisborne	Quincy	Feb. 18, 1903	30
1870	Carlton, Charles Augustus	Salem	June 12, 1902	61
1876	Chadbourne, Francis Watts	Lowell	Aug. 21, 1902	58
1875	Chase, Charles Edmund	Woburn	Dec. 26, 1902	53
1865	Cleaveland, Daniel Atheam	Hyannis	Feb. 21, 1903	72
1872	Couch, John Francis	Somerville	Jan'y 4, 1903	56
1869	Cushing, Henry Joseph	Merrimac	Nov. 18, 1902	65
1846	Downes, Nathaniel	Boston	Jan'y 8, 1903	84
1854	Garland, Joseph	Gloucester	Sept. 4, 1902	80
1854	Gifford, Silas Swift	Avon	Sept. 18, 1902	78
1897	Hamlin, Charles Franklin	Medway	May 16, 1903	33
1846	Harlow, Edwin Augustus Warren	Wollaston	Oct. 12, 1902	88
1870	Hildreth, William Hartwell	Newton U. Falls	Jan'y 15, 1903	58
1880	Holbrook, William	Palmer	April 27, 1903	79
1882	Holmes, William Dennison	South Braintree	May 21, 1903	42
1862	Homans, John	Boston	Feb. 7, 1903	66
1848	Howe, Charles	Taunton	Feb. 12, 1903	82
1849	Peirce, James	Kingston	Dec. 18, 1902	87
1856	Perry, Edgar	Vineyard Haven	April 1, 1903	80
1885	Richards, James Forsaith	Hyde Park	June 18, 1902	49
1875	Richardson, John Henry	Roxbury	Oct. 21, 1902	59
1899	Walsh, Peter Duggan	Pittsfield	March 23, 1903	36
1883	Whittier, Edward Newton	Boston	March 24, 1903	43
1887	Wyman, Morrill	Holyoke	Sept. 8, 1902	43
1879	Jones, Henry Newell	Methuen	Aug. 25, 1902	54
1899	Leach, William	Boston	April 7, 1903	47
1861	Lincoln, John Clifford	Andover	May 13, 1903	70
1856	Mecuen, George Edward	Medfield	July 22, 1902	74
1858	Noyes, Henry Allen	Boston	Aug. 10, 1902	79
1869	Parker, Charles Frederick	Boston	June 14, 1902	60
1837	Patten, Julia Maria	Cambridge	Jan'y 30, 1903	90

The following has been restored to the privileges of membership:

Patrick Henry Keefe, of Providence, R. I.

The following names have been changed:

Aberle, Lillie Anastasia to Bartols, Lillie Anastasia.
Paulsell, Mary to Mitchell, Mary Paulsell.

The following have been placed on the retired list:

Charles V. Bemis, of Medford.
William W. Eaton, of Danvers.
Jesse F. Frisbie, of Newton.
Richard J. P. Goodwin, of Malden.
Silas P. Holbrook, of East Douglas.
Joseph B. Kingsbury, of Holbrook.
John Q. A. McCollester, of Waltham.
William L. Macdonald, of Wellesley Hills.
William B. Mackie, of Boston.
Edward B. Nims, of Springfield.
John E. Parsons, of Ayer.
James P. Prince, of Durban, South Africa.
Arthur Ricketson, of New Bedford.
Edward M. Skinner, of Jamaica Plain.
Charles W. Swan, of Brookline.

The following resignations have been accepted:

Lillie A. Bartols, of Jamaica Plain.
William E. Baxter, of Boston.
David W. Byers, of Boston.
Frederick S. Cate, of Wakefield.
Francis E. Corey, of Alhambra, Cal.
James P. Goray, of Roxbury.
Ambrose H. Harding, of Guilford, Me.
William A. Jackson, Jr., of Atlanta, Ga.
Rufus C. MacDonald, of San Francisco, Cal.
Delos B. Manchester, of Oneonta, N. Y.
Sydney R. Marvin, of Springfield.
Mary B. Nicola, of Melrose.
Frank A. Ross, of South Berwick, Me.
Phebe A. Sprague, of Holly, N. J.
David R. Steere, of Groton.

The following, having neglected or declined to pay their assessment dues for the past three years, have been deprived of the privileges of membership, in accordance with By-Law VIII.:

Edward H. Abbe, of New Bedford.
Roger T. Atkinson.
William H. Bertram, of East Boston.
Samuel C. Bridgham, of Pasadena, Cal.
Ransford D. Canedy, of North Adams.
George B. Coon, of East Walpole.
John N. Coghlan, of Holyoke.
James H. Dennis, of Worcester.
Frank E. Draper, of Boston.

Charles L. Gibson, of New York, N. Y.
Clarence M. Godding, of Providence, R. I.
Daniel Goodenow, of Maynard.
George C. Hall, of Chelsea.
George Holbrook, of Waterbury, Conn.
Chauncey A. Jacobs, of Brookline.
James N. Keniston, of Middletown, Conn.
Arthur T. Mann, of Minneapolis, Minn.
Victor Mignault, of Lawrence.
Flora E. F. Moody, of Springfield.
Lois L. Nelson, of San Francisco, Cal.
Otis K. Newell.
Safier R. Rohrer, of Collinsville.
Edwin W. Ryerson, of Chicago, Ill.
Herbert K. Stiles, of Somerville.
Eddy B. Swett, of Goffstown Centre, N. H.
John McQ. Thompson, of Dorchester.
Charles D. Underhill, of Boston.

The following has been expelled:

Charles A. Peabody, of Worcester.

SUPPLEMENT No. III. TO CATALOGUE OF 1902.

Admissions reported since June 9, 1903.

1903	Adams, Eva Argene	Boston.
1904	Adams, Zabdiel Boylston	Boston.
1903	Andrews, John Henry	Lynn.
1904	Austin, Mabel Fletcher	Roxbury.
1903	Averell, Charles Wilson	North Reading.
1903	Baker, Osmyn	Northampton.
1904	Ball, Clarence Franklin	Melrose.
1903	Barnes, Allan Foster	Cambridge.
1903	Beal, Howard Walter	Worcester.
1903	Benner, Richard Stanwood	Springfield.
1903	Berry, Nathaniel Leander	Lynn.
1904	Blair, Orrin Curtis	Lynn.
1903	Blodgett, Harold Percival	South Framingham.
1904	Bond, Walter Legrand	West Somerville.
1903	Bowditch, Henry Ingersoll	Boston.
1903	Boyle, John Francis	Lowell.
1903	Brady, James Francis	Boston.
1903	Brayton, Roland Walker	Dorchester.
1903	Burr, Noah Arthur	Springfield.
1904	Cahill, George Stephen	Cambridge.
1903	Calkins, Irving Romaro	Springfield.
1903	Cholerton, Herbert	Somerville.
1903	Clapp, Arthur Martin	Springfield.
1904	Clark, Franklin Edward	Salem.
1904	Clarke, George William	Lowell.
1904	Coburn, Horace Fordyce	Lowell.
1904	Crocker, Louis Allen	Brewster.
1903	Cummings, Michael Aloysius	Fall River.
1903	Cunningham, John Henry, Jr.	Boston.
1904	DeNormandie, Robert Laurent	Boston.
1903	Derby, George Strong	Boston.
1903	Derrick, George William	Rutland.
1904	Donahue, Francis William	Greenfield.
1904	Downing, Charles Harland	Brookline.
1903	Draper, Arthur Derby	Boston.
1904	Drew, Frederick Prescott	East Dedham.
1903	Dwinell, William Grout	Boston.
1904	Dyer, Ernest Arcy	Salem.
1903	Ellis, Robert Hale	Braintree.
1903	Emerson, George Edward	Tewksbury.

1903	Erving, William Gage	Boston.
1904	Evans, Miner Harlow Amos, Jr.	Jamaica Plain.
1904	Eveleth, Charles Wonson	Marblehead.
1903	Feeley, Charles Philip	Cambridge.
1903	Fennessey, John Francis	Boston.
1903	Fernald, Guy Goodwin	Waverley.
1903	Ferris, Phœbe Annie	Boston.
1904	Field, Martin Thomas	Salem.
1903	Fuller, Charles Benjamin	Waltham.
1904	Galvin, Augustus Hughes	Springfield.
1903	Gay, Fritz Walter	Malden.
1903	Generalis, Demosthenes John	Lowell.
1904	Gifford, Nathaniel Howland	Boston.
1903	Gilfillan, Donald Robert	Northampton.
1904	Godfrey, Thomas Francis	Springfield.
1904	Goodall, Harry Winfred	Boston.
1904	Grant, William Victor	Lawrence.
1904	Graves, Robert John	Boston.
1903	Hare, William Andrew	Gilbertville.
1903	Harriman, Perley	Lynn.
1903	Hawes, John Bromham, 2d	Boston.
1903	Hickey, James Eloi	Springfield.
1903	Hickey, John Joseph	Springfield.
1903	Hillard, James Pearse	Springfield.
1904	Hunt, Wilson Eugene	Malden.
1903	Hurley, John Joseph	Newburyport.
1903	Jackman, Alice May	Wakefield.
1903	Johnson, Peer Prescott	Beverly.
1904	Joyce, James Henry	Salem.
1903	Kapp, Julia Seaton	Roxbury.
1904	Katsainos, George Michel	Lowell.
1903	Keaney, Henry Joseph	Everett.
1903	Keisker, Laura	Boston.
1903	Kenealy, Joseph Henry	Northampton.
1904	Kinloch, Raymond Alexander	Springfield.
1903	Knowles, Robert Keneborough Black	Gloucester.
1903	Langworthy, Henry Glover	Dubuque, Iowa.
1903	Lemaire, Willard Wallace	Taunton.
1904	Lilienthal, Alice	Cambridge.
1903	Lindquist, Carl Augustus	Everett.
1904	Lindsey, John Hathaway	Fall River.
1903	Livingston, Clarence Bertram	Lowell.
1903	Locke, Edwin Allen	Boston.
1903	Long, Margaret	New York, N. Y.
1903	Lynch, Cornelius Joseph	Quincy.
1904	McCausland, William James	Quincy.

1904	McCormick, Thomas Joseph Henry	Roxbury.
1903	Mackay, Andrew Joseph	Salem.
1904	Macrae, Annie Campbell	Fall River.
1903	Marcley, Walter John	Rutland.
1903	Markham, Erwin Walter	Lee.
1904	Martin, John Brayton	Lynn.
1903	Mead, Louis Guy	Boston.
1904	Moline, Charles	Sunderland.
1903	Mooring, Scott Webber	Gloucester.
1904	Morton, Arthur Oscar	Monson.
1904	Murphy, Edward Martin	Lowell.
1904	Murphy, Frank Augustine	Taunton.
1903	Myers, Samuel William	Boston.
1903	Norris, Albert Perley	Cambridge.
1904	Osgood, George Edward	West Somerville.
1903	Packard, Frederic Henry	Waverley.
1904	Parker, Ernest Lawrence	Boston.
1904	Pastene, Albert Angelo	Dorchester.
1903	Poirier, Horace	Salem.
1903	Porter, Robert Brastow	Boston.
1904	Pote, Leonard Holden	Somerville.
1903	Quinby, William Carter	Boston.
1904	Raymond, Loring Hay	Boston.
1903	Ripley, William Littlefield	Newton.
1903	Roberts, Albert Joseph	Bridgeport, Conn.
1903	Robinson, Samuel	Boston.
1903	Rodrick, Albert Fowler	South Framingham.
1904	Rose, William Milton	Cambridge.
1904	Ruston, Warren Dunn	Boston.
1903	Sanborn, Frederick Rodney	Lynn.
1904	Shannon, James Herbert	Boston.
1904	Shead, Edward Wadsworth	Cambridge.
1904	Sherburne, Andrew Edward	Dorchester.
1903	Simmons, Hannah Coralynn	Worcester.
1903	Sise, Lincoln Fleetford	Medford.
1903	Smith, Hervey Lewis	Springfield.
1904	Smith, Homer Brandel	Boston.
1904	Southard, Elmer Ernest	Boston.
1903	Spalding, Roger	Boston.
1904	Sproull, John	Haverhill.
1903	Stanton, Joseph	Boston.
1903	Stearns, Robert Thomas	New Bedford.
1904	Stevenson, Willis Mack	Cambridge.
1904	Stone, Murray Chaffee	Fitchburg.
1903	Stowell, Frank Edgar	Worcester.
1904	Street, Charles Edward	Springfield.

1903	Sullivan, Edward Coppinger	Brooklyn, N. Y.
1903	Taylor, Erwin Hartwell	Pittsfield.
1904	Thompson, Frederick Henry, Jr.	Fitchburg.
1904	Thompson, Wellington Andrew	Boston.
1903	Thorndike, Townsend William	Boston.
1904	Urquhart, John Edwin	Ashfield.
1904	Varnum, Leavitt R. J.	Lowell.
1904	Vejux-Tyrode, Maurice Paul Octave	Boston.
1904	Walcott, Henry Joel, Jr.	Springfield.
1904	Walsh, John Edward	Revere.
1904	Ward, Edward Silvanus	No. Attleborough.
1903	Wheatley, Louis Frederick	North Abington.
1903	Whittle, John Augustus	Wakefield.
1903	Wiggin, William Irving	Lowell.
1904	Wolbach, Simeon Burt	Boston.
1903	Wood, Henry Walton	Taunton.
1904	Worthen, Charles Arthur	Lynn.

List of Deceased Fellows.

Admitted.	Name.	Residence.	Date of Death.	Age.
1868	Blodgett, Charles	Holyoke	June 25, 1903	75
1869	Chase, Henry Melville	Lawrence	June 15, 1903	65
1854	Cornish, Theodore Osgood	South Boston	May 23, 1904	80
1840	Dale, William Johnson	North Andover.	Oct. 7, 1903	88
1897	Dunn, Stephen Joseph	Springfield	June 27, 1903	29
1895	Engelmann, George Julius	Framingham	Nov. 16, 1903	56
1869	Folsom, Norton	Cambridge	Sept. 12, 1903	61
1891	Gallison, Jefferson Cushing	Franklin	Feb. 22, 1904	63
1871	Hale, Josiah Little	Brookline	Dec. 21, 1903	62
1870	Hartwell, Benjamin Hall	Ayer	Jan'y 7, 1904	59
1883	Haven, George	Boston	Sept. 27, 1903	42
1836	Ingalls, William	Roxbury	Dec. 1, 1903	90
1881	Liebmann, Gustav	Boston	Feb. 20, 1904	71
1870	Moulton, Benjamin Francis	Lawrence	May 3, 1904	58
1889	Murphy, Daniel Francis	Woburn	Jan'y 31, 1904	44
1875	Nott, Albert	West Newton	Oct. 10, 1903	56
1871	Oliver, Joseph Pearson	Boston	Sept. 11, 1903	58
1873	Quimby, Samuel Foster	Salem	Dec. 21, 1903	63
1883	Race, Gorton Herbert	Gt. Barrington.	July 22, 1903	50
1878	Read, Robert McLellan	Boston	April 21, 1904	55
1859	Robinson, Jonathan Henry	Southborough	March 11, 1904	73
1872	Wadsworth, Peleg	Malden	April 2, 1904	69
1897	Weeks, William Joshua	Malden	Dec. 23, 1903	29
1846	Wellington, James Lloyd	Swanzey	Dec. 18, 1903	86
1894	Wheeler, Charles Augustus	Leominster	Feb. 11, 1904	67
1883	Wheeler, Edward Reed	Spencer	April 30, 1904	64
1892	White, Charles Warren	Fairhaven	May 15, 1904	44
1875	White, Horace Carr	East Somerville	Nov. 26, 1903	67

The following name has been changed:

Grice, Julia to Kennelly, Julia Grice.

The following have been restored to the privileges of membership:

Ransford DeLos Canedy, of North Adams.
George Bailey Coon, of East Walpole.
John Augustus Horgan, of Roxbury.
William Ellsworth McPherson, of Charlestown.
Frederick Tigh, of Newburyport.

The following have been placed on the retired list:

Rebecca Barnard, of Worcester.
Henry R. Brissett, of Lowell.
James A. Bushee, of Medford.
George Dresser, of Chicopee.
Henry W. Dudley, of Abington.
P. O'Meara Edson, of Roxbury.
C. Ellery Stedman, of Boston.
Rollin C. Ward, of East Orange, N. J.

The following resignations have been accepted:

Irving R. Bancroft, of Telluride, Colo.
Harold C. Goodwin, of Concord, N. H.
Robert Hazen, of Thomaston, Conn.
Walter K. Jewett, of Albany, N. Y.
John W. Nelson, of Jamestown, N. Y.
Wilbur F. Noyes, of Lamar, Colo.
Andrew F. Reed, of Arlington.
Charles E. Ryder, U. S. Navy.
Silas G. Soules, of Hudson.
Philip K. Taylor, of Kingston, R. I.

The following having neglected or declined to pay their assessment dues for the past three years, have been deprived of the privileges of membership, in accordance with By-Law VIII.:

Frederick S. Bennett, of Roxbury.
Ellis H. Cornish, of Carver.
Michael R. Donovan, of Lynn.
Paul F. Ela, of East Douglas.
Harvey A. Field, of Dorchester.
John A. Follett, of Brookline.
Edward M. Harding, of Boston.

Cornelius P. Harkins, of Jamaica Plain.
Edward B. Hodskins, of Springfield.
Louis D. O. Jacques, of Worcester.
Eugene T. McNamara, of Boston.
Edward C. Newton, of Everett.
William D. Nutter, of Malden.
Walter H. Pigeon.
William G. Potter, of New Bedford.
Waldo H. Tyler, of Cambridge.

The following has been expelled:

George S. Hatch, of Boston.